ELECTRICAL REVIEW

August 24, 1945

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXVII. No. 3535. AUGUST 24, 1945 9d. WEEKLY

Radar Achievements

Decisive Contribution to Victory

HISTORY will no doubt confirm the verdict of Sir Stafford Cripps that the most important contribution by science to victory has been the method initiated in this country of detecting the direction and range of distant objects by means of radio. In its wide pervasiveness as well as in its availability at the most crucial stage of the war, radar—or radiolocation as it was at first known—influenced the course of events far more decisively than did, for instance, the splitting of the atom of U235, which hastened a conclusion that was no longer in doubt. Radar also offers many more tangible advantages for the immediate future, some of which are already taking shape.

Developments in Technique

Far-reaching developments have been made in radar technique since the tentative efforts at Orford Ness bore fruit in giving indispensable aid to " the few " in winning the Battle of Britain. Based upon established knowledge of the speed of propagation of electro-magnetic waves in space and earlier investigations into existence of the Heaviside layer (the value of which then seemed mainly academic), the devices adopted for making oscillograph measurements of the time taken by radio emissions to be reflected back from hostile aircraft enabled the location of the latter to be accurately determined, with momentous consequences. Later the use of centimetre waves (made practicable by the Magnetron) led in various ways to the ultimate destruction of enemy war potential.

The scientific basis of radar formed the subject of Sir Edward Appleton's Kelvin lecture last April. Our readers may also be referred to the elucidation of the principles involved which was published in *Wireless World* for February and March last. From the official information on the achievements of radar which was released last week it is apparent how essentially a matter of team work its building up has been. Universities, research establishments and individuals have all added their quota. Some contributions have been outstanding, but their practical value has depended upon their ability to fit in with less notable ideas of others. The efficiency of these brilliant intellectual achievements has resulted from the ability of manufacturers to give them material form and in this amazing adaptability has been demonstrated.

Manufacturers' Part

Many of the concerns, to whom well-deserved tribute is now officially paid, are probably better known to the majority of our readers for heavier types of products. As accounts that have appeared in our columns show they have managed to maintain their position in these fields as well as to expand their activities in the kind of work now under discussion, about which we have perforce been silent hitherto. Other companies figure in the account that had previously no association at all with this branch of electrical work, while many of the firms entrusted with special work are quite small.

With the return of easier working conditions—production was disturbed by

bombing at critical times, when several factories were destroyed, and routine had often to be upset by the exigencies of "crash" programmes—full advantage can be taken of the experience gained to develop either new techniques or those in existence of which particulars have yet to be divulged. The reactions of radar on heavier plant practice should become increasingly manifest in addition to its at present more obvious effects on air and sea navigation.

Government's Intentions

THE King's Speech at the opening of Parliament last week referred to the Government's intention to introduce a Bill for the nationalisation of the coal-mining industry which was stated to be "part of a concerted plan for the co-ordination of the fuel and power industries." This statement was later amplified by Mr. Attlee in his reply to the debate on the Address when he spoke of converting the provision of fuel, light and power to a public service, though he did not say what form it is proposed that this shall take. It appears, however, that the Government's immediate pre-occupation will be with coal. The Prime Minister made an appeal for all in the industry to do their utmost to increase production, and users of fuel, light and power to exercise the greatest economy this winter to alleviate the very serious situation. The Minister of Fuel and Power, Mr. Shinwell, speaking at Blackhall, Co. Durham, last week, said that he had set a target of an additional 8,000,000 tons of coal in the next six months.

Man-Power

SINCE we wrote last week of the man-power difficulties faced by electrical manufacturers the Prime Minister has given an indication of the Government's plans for meeting the needs of industry. Within the next two months a million workers are to be released from munitions production, and demobilisation from the Armed Forces is to be accelerated so that by the end of the year 1,100,000 will have returned to civil life, including 100,000 in "Class B." Mr. Attlee also spoke of the necessity for the country to set itself resolutely to the task of increasing exports in spite of the very great demands of the home market. Reports from overseas show that countries all over the world are pushing ahead with electrical development plans and it is vitally important, now the war is over, that British electrical manufacturers shall be quickly relieved of man-power worries to enable them to secure a large share of the work available.

R.F. Heating

NEED of speed in production during the war has given a great fillip to the heating of electrically non-conducting materials by capacity currents at frequencies usually associated with radio. Since the heat is generated internally it is effective immediately and evenly throughout, leading to improved results; moreover, thickness of material has not to be taken into account. Information on the subject is scattered and the E.R.A. has done well to collate it in convenient form. Costs are at present high, but more extended use should bring these down. In some ways the process is independent of economics since, as the Report points out, it has made possible things which had previously been impossible.

A Name Wanted

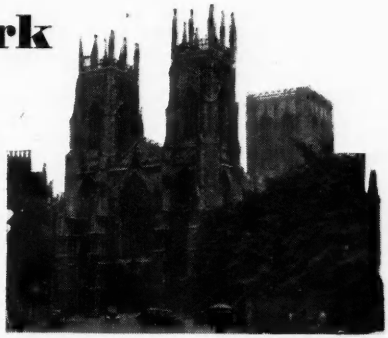
THIS use of electricity for heating still lacks a generally accepted name. Many are in use. The earliest, radio-vulcanisation, is outworn; heatronic is etymologically an objectionable hybrid. High-frequency heating is inadmissible in view of its long use in connection with electric smelting at about 2,500 cycles per second. Dielectric heating conveys no indication of the significance of frequency and is associated with the warming up of cable insulation. Radiotronic and electronic heating are favoured by some. The E.R.A. prefers the term capacity-current heating. Our choice is radio-frequency heating, with RF heating as its abbreviation. This brings into prominence the use of frequencies of from 1 to 50 megacycles. If necessary to indicate the exclusion of eddy-current heating, dielectric heating is available as a sub-classification.

Detection

A NEWSPAPER says that it will eventually be possible to cook the family joint by radar. With present rationing radiolocation's primary function is no doubt more applicable.

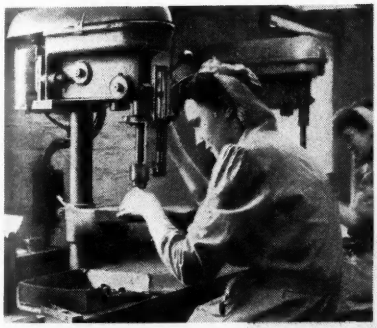
Progress at York

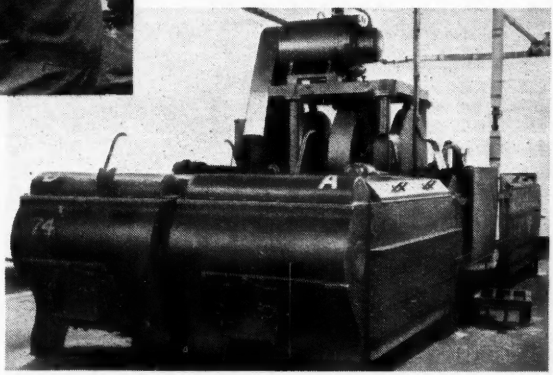
Industrial, Domestic and Rural Supplies Provide a Well-Balanced Load



THE ideal for which all electricity undertakings strive is a well-balanced load. It has certainly been achieved at York (city electrical engineer: Mr. E. J. Nichols) where the load of the Electricity Department is divided almost equally between industrial and domestic supplies and where the backing of the urban load has, thanks to the Department's enterprise, made it possible to extend its activities to virtually the whole of a 135-sq. mile rural area. To be more precise, only five hamlets comprising between them less than 150 houses do not receive supplies and these would all have been connected by now but for the war.

Commencing operations within the city in 1900, the undertaking took in the neighbouring 121 sq. miles of what is now styled the "urban area," though the term is somewhat of a misnomer since it is almost completely rural in character, containing only residential "dormitory" estates, farms and agricultural cottages, with no industry except a few sand, gravel and small brick works and one tannery. No one can dispute the rural nature of the "extended" or rural area proper, for which powers to supply were obtained in 1929. Its population (11,083) is only 82 per sq. mile and there is actually only one industry, Derwent Plastic Mouldings, Ltd.; it operates in a converted malt kiln at Stamford Bridge (the site of the battle between Tostig and Harold II in 1066) and requires 120 kW for presses, drills, fluorescent lighting, etc. It has been making high-priority thermo-setting mouldings for the Services but is now just starting to change over to domestic goods, including electric iron connectors. The only other non-domestic and non-agricultural use of electricity in the "extended" area is railway signalling. With a 100 per cent. load factor the 11½-mile section of lines between York and Tollerton has an annual consumption of 200,000 kWh.



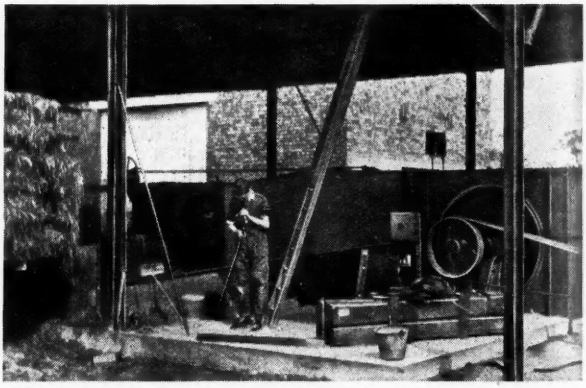


An electric drill in use at the works of the only industrial consumer in the rural area, Derwent Plastic Mouldings, Ltd., which takes 120 kW. Right: One of the electrically driven conches used by Rowntree & Co., the undertaking's largest consumer

There has thus been little inducement from the prospective revenue point of view for the

undertaking to bring electricity to this area, apart from its public-spirited desire to provide the benefits of electricity to as many consumers as possible. Justification of this policy is furnished by the fact that consumers in the rural area now total 2,425 (72 per cent. of the potential number) and that the load and annual consumption have increased since 1939 respectively from 1,130 to 2,900 kW and from 962,371 to 2,784,993 kWh. This represents a rise in the consumption per head of the population from 86·83 to 251·3 kWh and per consumer from 423·39 kWh to 1,148·45 kWh. Furthermore, while in the early stages there were slight losses on the rural area, for the past three years profits amounting to £3,484 have been made. Last year the revenue per consumer amounted to £7 9s. 5d., £3 17s. 2d. more than in 1938–39. To avoid misleading comparisons two aircraft repair works (requiring 500 kW each), six aerodromes (requiring in all over 1,300 kW) and other supplies to Service establishments have been regarded as temporary only and have been excluded from the above figures.

Aeroplane propeller production is a new industry undertaken at the works of Joseph Terry & Sons, who now use five million kWh a year



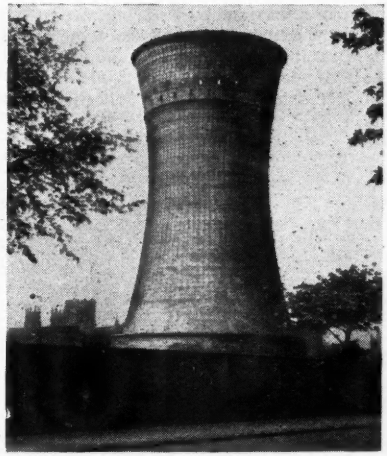
Grass drying is one of the newer agricultural applications of electricity. Here is a new plant being completed at Mr. Head's farm at Shipton-by-Beningbrough

Of the Department's 20,000 kW of industrial load Rowntree & Co.'s confectionery works take by far the largest portion, about 4,000 kW, and use up to 22,000,000 kWh a year, or nearly one-fifth of the total power sales, there being a load factor of over 50 per cent. Another confectionery works, that of Joseph Terry & Sons, Ltd., requires 800 kW and consumes approximately 5,000,000 kWh annually. The consumption at this factory increased considerably during the war years, as besides making confectionery, the company has been turning out ten tons of jam a day. The engineering department has also machined a total of 182,000 parts for aero-engines. In addition, a dispersal factory, for the production of aeroplane propeller blades was created on these premises. It has been operated by and under the control of F. Hills & Sons, Ltd., and approximately 100,000 propeller blades have been manufactured and dispatched during the past three years.

The London & North-Eastern Railway Co.'s. carriage works and several glass, brick, printing and small engineering works account for most of the rest of the industrial load. In addition considerable supplies are taken for water and sewage pumping and at the moment alterations are being carried out to the

electric pumping plant at the main sewage pumping station at Fulford to carry the sewage to settling tanks three miles away. Even in peacetime York has a substantial military load, the permanent camp at Strensall taking approximately 125 kW.

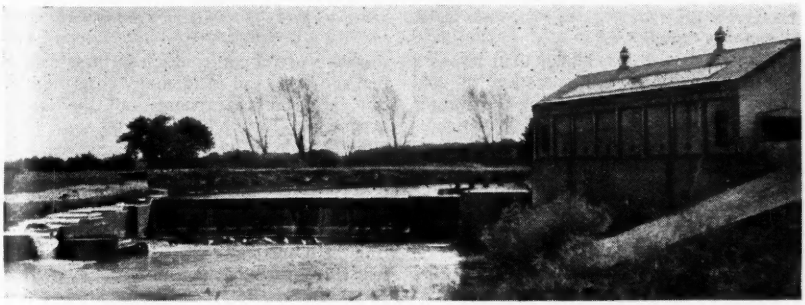
Although electricity has been available to all but the isolated districts, it is only in the past five years or so that farmers have become electrically minded. Labour difficulties, coupled with increased prosperity, have resulted in a great demand for electrical apparatus of all kinds. In addition to chaff and root cutters, pumps and domestic apparatus, etc., electric milking machines have become very popular and a number of electric sterilisers too has been installed. Grass drying is one of the newer applications that seem to have a big future and while we were touring the area we were just in time to see the finishing touches being put to a new installation at Mr. G. G. Head's Laund House Farm at Shipton-by-Beningbrough. This plant incorporates a 15-HP motor driving the fan, a 60-HP unit for the mill and a 10-HP motor for the preheater. A baler when installed will require another 6-HP motor. To provide for this and other electrical apparatus used on the farm a 2,200-yd. extension of 6·6-kV mains was necessary, with the erection of a 75-kVA pole-mounted transformer. Other rural loads which are increasing include school catering (many inquiries for this are now being dealt with) and welding by village blacksmiths, the latter being not altogether welcomed incidentally in view of the heavy intermittent load and surges produced.



Though criticised the Electricity Department's new cooling tower is a graceful structure

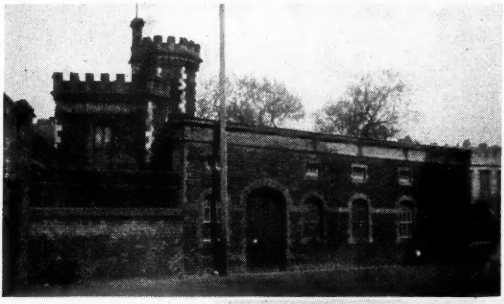
While practically all villages and hamlets now have supplies, there are of course considerable numbers of farms and other isolated buildings still unconnected. Good progress is, however, being made in supplying these, though frequently this may mean extending mains a couple of miles or so. No hard and fast rule is made about defraying the cost of these extensions. Farmers are given the option of either making a contribution to the capital cost of the extension or guaranteeing a certain consumption, or both.

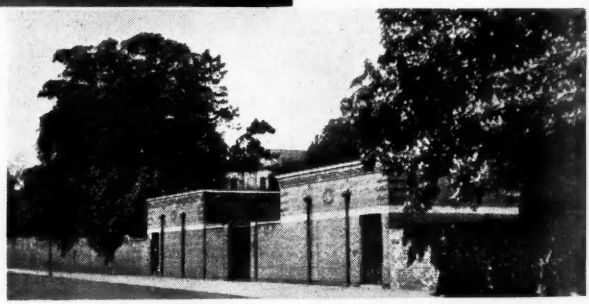
One of the major factors in developing the use of electricity has been the exceptionally low tariffs. For instance, in the inner districts consumers on the rateable value tariff pay only $\frac{1}{3}$d. per kWh for their energy in addition to the $12\frac{1}{2}$ per cent. per annum fixed charge. With a 10 per cent. discount for prompt



The small hydro-electric station at Linton-on-Ouse makes a useful contribution towards meeting the fuel shortage

payment many consumers thus get their electricity for less than ½d. per kWh. Tariffs increase progressively in four stages the farther one gets from the city but even in the most remote areas the " unit " charge is only ⅜d. with a fixed charge of 20 per cent. and a discount of 7½ per cent. Flat-rate charges for lighting range from 6d. down to 2½d. per kWh, and for power from 2½d. to 0·72d. per kWh, less discount. Under a maximum demand system the charge in the city area is 6d. per kWh until the energy consumed equals that required for use of the consumer's maximum demand for 91 hours per quarter, the rate beyond this demand being ¾d. per kWh. The corresponding prices in the most remote areas are 7d. and 1d.





Substations are designed to harmonise with surroundings: Lendal Bridge (above), one of the first to be erected and Acomb (right), one of the most recent

For the whole area the average price for all purposes is only 0·8d., which is in fact 0·03d. higher than it was a year ago owing to the operation of coal clauses. For the rural area alone the average price last year was 1·57d., which compares with 2·047d. in 1939 and 2·83d. ten years ago. This achievement has been possible despite substantial contributions to the relief of the rates, amounting in all to about £130,265, last year's contribution totalling £13,000. The undertaking has shown a profit in the past twenty-six years, last year's figure being £18,925, and of a total capital expenditure of £2,081,000 the outstanding debt is only £792,000.

To keep pace with the increasing demand a 20,000-kW Brush turbo-alternator set and one 100,000 lb. per hour John Thompson boiler were put into service in 1941, followed a year later by a second similar boiler and a cooling tower, which despite adverse criticism is a graceful structure which interferes not at all with the usual views of the Minster. At the same time the coal-handling facilities were improved by the installation of a new belt conveyor and grab scraper and by the extension of the coal sidings to accommodate 7,000–8,000 tons. Future plans provide for the duplication of the 20,000-kW set.

Apart from two 6,000-kW and one 3,500-kW Oerlikon sets which have all been in operation for twenty years or more, the generating facilities also include a small hydro-electric plant at Linton-on-Ouse. Here one 540-kW and one 210-kW alternator have since 1923 made use of an 11–12 ft. head of water to produce 2–2½ million kWh a year, which though representing only a very small proportion of the undertaking's total requirements makes a useful contribution in these days of fuel shortage, and incidentally costs nothing but the running expenses, all the capital expenditure having been paid off some years ago.

Distribution in the urban (1914 Order) area is at 6·6 kV, about forty-four of the ninety-seven miles being overhead. For the rural (1929 Order) area an 11-kV system is used, a ring-main encircling the whole district being fed from three main substations at Nun Monkton, New Earswick and Stockton-on-the-Forest, where the supply is stepped up from 6·6 kV. All the 11-kV system is overhead,

the length of main now reaching eighty-seven miles. L.v. mains throughout the area total 649 miles. Special care has been taken in many cases to conceal the overhead lines and poles from the roads by running them behind rows of houses. A feature of the 113 substations provided is the way in which they have been designed to harmonise with the surroundings, whether ancient or modern, urban or rural.

The undertaking has not been without its wartime trials and tribulations. Apart from the normal difficulties of shortage of staff, etc., it was, it will be remembered, the target of one of the " Baedeker " raids in April, 1942. Though over 100 h.e. bombs and numerous incendiaries were dropped, the power station sustained no worse damage than broken windows, no substation or h.v. distributor was hit and all damage to l.v. distributors was put right in six days, most consumers being reconnected within forty-eight hours. Also, out of nearly 11,000 cookers only 90 were damaged (7 total loss), other casualties being 45 kettles (5 total loss) out of 20,000 and 28 washboilers (1 total loss) out of 7,000. Both war damage and normal repairs are for the most part dealt with by the undertaking's own repair shops, though a certain amount is done by neighbouring undertakings under a mutual assistance scheme.

Now that the war is over, Mr. Nichols has a number of development schemes in view. Apart from supplying electricity to some 550 temporary houses, arrangements are being made to serve 4,000 municipal houses which it is anticipated will be erected on the west side of the city, together with 1,000 houses to be built by private enterprise. To provide for these it is proposed to lay five 11-kV underground feeders from the generating station, and an additional feeder to the west side of the 1929 area. On the south side of the city it is proposed to lay an 11-kV feeder to provide for housing development, while the 6·6-kV ring transmission lines on the south-east and north sides of York will be completed. Supply will be extended to the five hamlets in the 1929 area still not served, and the remaining DC load of 1,700 kW will be changed over to AC. In the current year it is proposed to install eight 500-kVA distribution transformers to meet the demands inside the city boundary. A site has been acquired at Melrose Gate for new offices to house the mains, meter, etc., staffs now accommodated at the power station.

We are indebted to Mr. Nichols and members of his staff, including Mr. E. M. Pearson, his chief assistant (who we regret has since died), Mr. S. Wright, substation engineer and Mr. T. Gowland, mains engineer, for their assistance in the preparation of this article.

The Housing Problem

SPEAKING at a luncheon given on August 14th at the Dorchester Hotel, W., by the House Building Industries Standing Committee, Mr. A. W. Curton, its chairman, referred to the provision of new houses as " post-war problem No. 1." Bad housing conditions, he said, were responsible for nearly as much evil as war. The thirty industrial associations connected with the Standing Committee had selected twenty-seven plans as national prototypes, avoiding drab uniformity and taking account of general economic considerations, incomes of the occupants, fuel conservation and labour saving. The building industry was prepared to co-operate fully with the Government, but it must have the labour and materials and be freed from unnecessary restrictions. The associations represented constructed 300,000 houses in 1938, but could bring the figure up to 500,000 per annum. Building resources, he urged, should not be frittered away in patching up old and unsuitable houses.

Major G. L. Reed (American Embassy) said that housing would present as big a problem in the United States, where a million new houses a year were needed. Capt. F. Girard (Ministry of Reconstruction, France) said that building conditions in his country were four times as bad as in 1918. Mr. J. H. Wilson (Parliamentary Secretary, Ministry of Works) referred appreciatively to the work of the building associations.

Mr. H. Comben (president, National Federation of Registered House Builders) commended houses for the people as just as worthy of architectural consideration as the more expensive types. Even more important than numbers of workmen was it that there should be a proper balance between craftsmen and semi- and un-skilled labour.

Mr. T. R. Braybon related home-owning to good citizenship and Mr. O. A. Aisher (vice-chairman of the Standing Committee) stressed the need for relieving women of tedious household work. An architect's view that bedroom space was not now fully utilised owing to insufficient heating was put by Mr. T. C. Howitt, while the need for refrigeration and adequate heating was stressed by Alderman Mrs. L'Estrange Malone (L.C.C.). After the luncheon an opportunity was provided of inspecting plans for prototype houses at the Building Centre, Maddox Street, W.

Views on the News

Reflections on Current Topics

WHENEVER I go round a farm I always come away with the impression not so much of the numerous uses to which electricity is, or could be, put, as of the *way* it is used. Generally speaking the application of electricity to duties on a farm takes the form of a conversion from some other motive power and the rôle of the electrical engineer is simply to install motors. There are of course exceptions, as for example in the case of dairy equipment, but it does seem to me after the outstanding welcome with which the "Essex" mill has been received by farmers that the electrical industry might take a further hand in the development of farm equipment. In designing the mill the Electrical Research Association showed that it was possible to do with a 3-HP motor what had previously required 10 HP or more. With the advent of combine harvesting might there not be an opportunity for a grain dryer designed first and foremost for electrical operation? Efficient though the converted models now in use are, I cannot believe that improvements could not be incorporated in equipment intended specifically to be run by electricity.

* * *

The report from America of the proposed introduction of a combined electric clothes washer, potato peeler, dish washer, sink disposal unit and ice-cream freezer reminds me of other suggested comprehensive combinations of appliances, *e.g.*, refrigerator, washer, built-in vacuum cleaner, etc. The idea of utilising the same motor to perform a number of different functions has its attractions, but there may be complications regarding gearing and clutches, etc., which in all probability would cost nearly if not quite as much as the necessary extra motor or motors.

* * *

One of the things that struck me most when I went to see the exhibition of plans for permanent houses which the House-Building Industries' Standing Committee is now holding at the Building Centre, Maddox Street, W.1, was the way in which the inclusion of a refrigerator in the equipment of a kitchen is now almost taken for granted. Before the war the refrigerator was only just beginning to get out of the luxury class. It may be quite a while yet though before the apparatus is available in any quantities. One manufacturer tells me it will be six months or more before production will really get into its stride. I was interested to notice too at the exhibition that most of the plans provided for a drying cupboard and that in a few cases arrangements were made to incorporate the new horizontal type of electric cooker. A continuous working space at a standard height around the kitchen seems to be generally accepted practice.

* * *

I have previously referred to the uncertainty existing with regard to the sharing of the cost of cables on temporary housing sites. I see that at Stratford the S.W. & S. Electric Power Co. has intimated to the Town Council that unless half of the temporary bungalows there are equipped with electric cookers, washboilers and refrigerators the Council will be asked to contribute £1,000 towards the cost of the cables. This seems to be a reasonable suggestion.

* * *

In the Aberdeen *Press and Journal* recently there appeared a note, under the heading "Uniform Electric Railways," to the effect that the four main-line companies had agreed to adopt the third-rail system of electrification to permit inter-running. Three days later the *People* reported that "Railways Fail to Agree" on the same subject and lamented that the inter-running of trains, so successful in wartime, would thus be impossible in future. Upon inquiry of the Railway Companies' Association I find, as I expected, that there is no basis for either of these statements—just journalistic licence again.

* * *

In a New Zealand journal this week I came across some remarks by Mr. H. S. Lamburd, president of the Wellington branch of the Royal Society, which attracted my interest. Suggesting that the use of wind-power plants in conjunction with hydro-electric stations should be investigated, he said that certain military equipment no longer required in Europe—barrage balloons particularly—would be extremely useful in New Zealand for upper-air investigation. Hitherto wind plants had only utilised the layer of air immediately adjacent to the earth where the wind was very variable, but investigations showed that at heights of 1,000 to 2,000 ft. not only was there a high degree of constancy but also a higher wind speed which gave greater power. In this connection it may be mentioned that the experimental wind-power installation at Grandpa's Knob in the United States is situated at a height of 2,000 ft.—

REFLECTOR.

Overhead-Line Charts—V

33-kV and 66-kV Lines

By J. S. Forrest,
M.A., B.Sc., F.Inst.P.

VOLTAGE-DROP charts for 33-kV lines are given in Figs. 13, 14, 15 and 16. The following examples illustrate the use of these charts in solving typical 33-kV and 66-kV line problems.

Example 6

A 66-kV line with 0·1 sq. in. conductors is 40 miles long, and supplies a load of 20 MW at 0·9 lagging power factor. The voltage at the receiving-end is 66 kV; what is the sending-end voltage?

The line is carrying 800 MW-miles at 66 kV which is equivalent to 200 MW-miles at 33 kV. Reference to the 33-kV chart for 0·1 sq. in. conductors (Fig. 14) shows that 200 MW-miles at 0·9 lagging power factor will give a voltage drop of 14 per cent. in the line. The sending-end voltage is therefore 75·3 kV.

Example 7

Compare the load-carrying capacities, based on a 10 per cent. voltage drop, of two 0·075 sq. in. 33-kV circuits, and a single 0·15 sq. in. 33-kV circuit, at load power factors of unity and 0·7 lagging.

It is seen from Fig. 13 that a 33-kV 0·075 sq. in. line will, for a voltage drop of 10 per cent., carry loads of 175 MW-miles and 88 MW-miles at power factors of unity and 0·7 lagging, respectively.

The corresponding loads for two circuits will be 350 MW-miles and 176 MW-miles. Fig. 15 shows that a single 0·15 sq. in. circuit will carry 320 MW-miles at unity power factor, and 120 MW-miles at 0·7 lagging power factor. The two 0·075 sq. in. circuits will therefore carry only 9 per cent. more load than the single 0·15 sq. in. circuit at unity power factor, but they will carry nearly 50 per cent. more load at a power factor of 0·7 lagging.

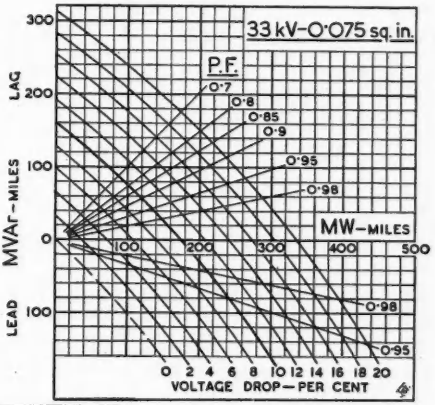


Fig. 13.—Voltage-drop chart for 33-kV line, 0·075 sq. in. equivalent copper S.C.A. conductors. (Use also for 66 kV)

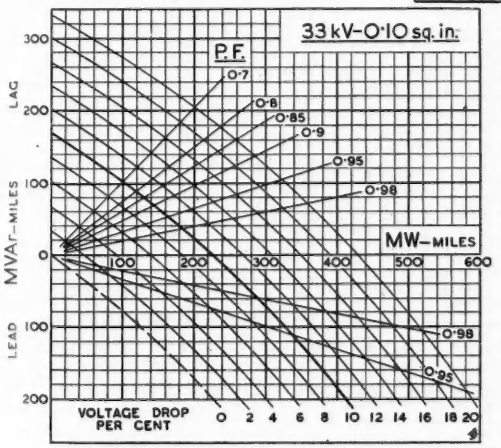


Fig. 14.—Voltage-drop chart for 33-kV line, 0·10 sq. in. equivalent copper S.C.A. conductors. (Use also for 66 kV)

Example 8

(a) *It is required to construct an overhead line 15 miles long to supply a load of 10 MW at 0·85 lagging power factor. What line voltage and conductor size would be suitable if the voltage drop in the line is not to exceed 10 per cent.?*

The load-carrying capacity of the proposed line can be expressed as 150 MW-miles. A glance at the charts for the various voltages*

* See previous instalments.

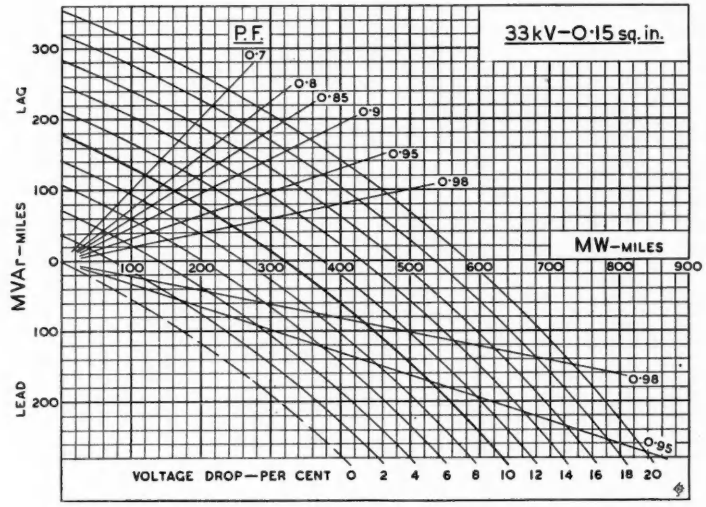


Fig. 15.—Voltage-drop chart for 33-kV line, 0·15 sq. in. equivalent copper S.C.A. conductors. (Use also for 66 kV)

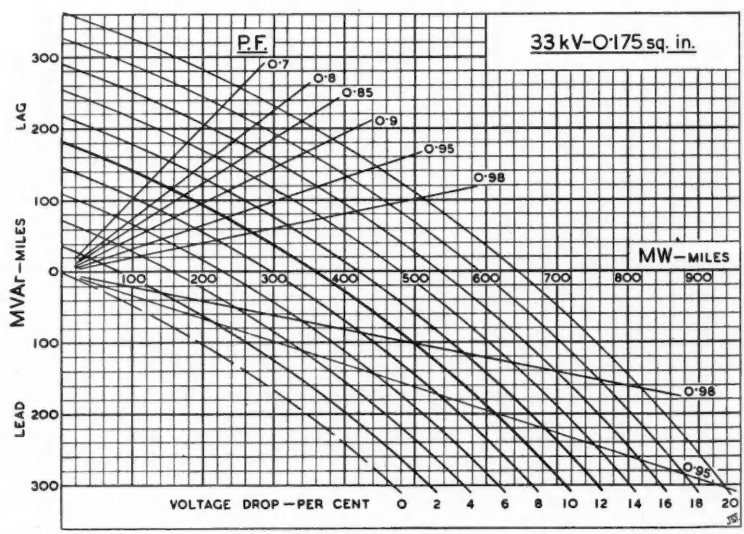


Fig. 16.—Voltage-drop chart for 33-kV line, 0·175 sq. in. equivalent copper S.C.A. conductors. (Use also for 66 kV)

makes it clear that this load cannot be carried by an 11-kV line, but that 33 kV would be a satisfactory voltage. Examining the problem in more detail, it is noted from Fig. 15 that a load of 150 MW-miles at 0·85 lagging power factor will give a voltage-drop of 9 per cent. The required conductor size is therefore 0·15 sq. in.

(b) *If the line is designed to enable the voltage to be ultimately increased to 66 kV, what will then be the load-carrying capacity for a voltage-drop of 10 per cent. and a power factor of 0·85 lagging?*

Fig. 15 shows that the load will be 160 MW-miles, or 10·7 MW, for the 33-kV line. At 66 kV the load-carrying capacity will be multiplied by 4, *i.e.*, the required load is 43 MW.

Education of Graduates

Overcoming Existing Handicaps

By E. Graham Ross, A.M.I.E.E.

REACTION of most seniors to the many complaints of graduates expressed in recent correspondence is, generally, that they are simply petulant. Their disillusionment is inclined to be dismissed peremptorily, while there is little realisation of the fact that the correspondence itself may be symptomatic of something deeper. The matter requires examination in wider sense, to the benefit of graduates and seniors alike.

Section V (*c*) of the White Paper (Cmd. 6458) on "Educational Reconstruction" remarks (phrases especially relevant to these notes are italicised):—

> "Without provision for adult education the national system must be incomplete. . . . It is *only when* the pupil or student *reaches maturer* years that he will have served an apprenticeship *in the affairs of life* sufficient to enable himself *fully* to fit himself for service to the community . . ."

This is translated into law by the Education Act, 1944, Section 41 of which provides that:

> "(*a*) . . . it shall be the duty of every *local* education authority to *secure* the provision, for *their* area of *adequate* facilities for *further* education, that is to say:
> "(*b*) *leisure*-time occupation in such *organised* cultural and recreational activities . . . for *any* persons, over compulsory school age, *able and willing to profit by* the facilities provided for that purpose."

Now, the graduate (or his equivalent in all walks of life) is so well past compulsory school age by the time he has taken his examination that he may be truly said to have begun to settle down to his future; his "maturer" years commence at around age twenty-five. What is not realised, however, is that his group (as referred to the whole population) is really large in numbers—although small in percentage. As nearly as may be the figures are 1,115,000 or 2½ per cent. The final total to be uncovered by the Education Act, 1944, is expected, indeed, to be higher.

At age twenty-five those studies of "primary necessity" have been completed. The man (or woman) has married and has now perforce to be busy making his niche, and the effort necessary is great. He very quickly meets resistance—the more provoking as it is unexpected. The disillusionment is not complete, however, until he suddenly finds himself faced with another, and thoroughly painful, situation. Should his "primary" struggle *not* meet with success, he stumbles upon the hard fact that he is not yet old enough to have established a second line as a defence against adversity.

The drive behind this last is powerful, often disturbing. The man finally finds himself forced into the position of requiring, willy-nilly, to divide his total effort into two broad categories, *viz.*, continuation and general development of the basis formed by his earlier tutorial years and gathering together components of quite another nature, out of which to create a "strategic reserve." Nor is that the least! In parallel, and quite as suddenly, he finds himself pitchforked into that (officially large) class of people visualised in para. 86 of the White Paper as the ". . . . much larger public *anxious to pursue* a variety of subjects on informal lines. . . ."

None the less, these difficulties stimulate: after the first inward turmoil has subsided, the new prospect lures him on. But, and it is a large but, his time for study is no longer of the earlier magnitude and is, at most, one to one and a half hours per night for seven nights per week. So that the preparation of

his second line of defence must be thought of, not in terms of five or seven years, but of ten or even fifteen years. By that time (say at forty years of age) he may reasonably anticipate the fruits of his further effort to mature—provided they are allowed to come to full maturity by the educational and like powers that be.

This is the crux of the whole matter. As things are to-day, these efforts are able to reach maturity only rarely. To illustrate by an extreme case: suppose the graduate's second bent to lie towards medicine. For full satisfaction study here calls for physics, chemistry (inorganic and organic), biology, anatomy, physiology, pharmacology and other subjects as desired, without counting surgical study; say to the M.B. degree. Now, such a curriculum under the graduate's new conditions calls for two years per subject to reach satisfaction, excluding any aspect of laboratory work. But, unfortunately, and again as things are, no university, or equal institution, will permit the completion of any course of this kind subject by subject. The aspirant may even take a final examination in each subject; he will receive no credit for passing. The diploma depends on the total of subjects only. The state of affairs is, further, so much worse on the ground that the required standard in any one subject demands daytime laboratory class attendance of magnitude—a physical impossibility with present industrial hours.

The Remedy

On this basis even the London University external degree courses (again total courses) are barred to the really earnest individual. So that, driven to adopt, say, correspondence tuition, the aspirant finds the otherwise excellent values of this form of study to end in frustration. The principle thus detailed applies to practically every form of study taken up to form one's second line of defence.

The state of affairs, however, also points the way to its rectification, provided the graduate class be prepared to direct its energies properly. There is every possibility that stalemate on "second-line" diploma work will become permanent unless the very earliest attention be given by graduates themselves to the provisions of the Education Act, 1944, Section 42 (again italicised):

> (1) Every local education authority shall, *at such times* and in such form as the Minister *may* direct, *prepare and submit* to the Minister *schemes for* further education. . . .
>
> (2) . . . the Minister *may* approve the scheme.
>
> (4) A local education authority shall, *when preparing* any scheme, *have regard to* any *facilities for* further education provided in *their* area, by universities, educational *associations and other* bodies . . . and the *scheme as approved* . . . *may* include such provisions as to the *co-operation of* any such bodies or authorities *as may have been agreed between them and* the authority. . . .

It is absolutely essential that these agreed schemes shall make full provision for subject by subject certification. Only by such form of adult education can the difficulty of the graduate be met. The idea of course will be resisted by present vested interests. The fundamental weapon to overcome this resistance is to be found in para. 87 of the White Paper: ". . . there will be *room for new* methods and *new approaches to meet new demands*. . . ."

Such is the spirit underlying the letter of the Act; it is up to graduates to plan their moves accordingly. Protest to the institutions is useless; these possess no authority to be interested in subjects outside their spheres. The local educational bodies must form the focus of first attack, backed by the Press in general, and technical Press in particular. Only by a campaign on these lines will this sense of graduate injustice be removed; by means that will enable the graduate to exercise his prerogative of citizenship.

Forthcoming Events

Tuesday, September 4th.—*Coventry.*—Electricity Showrooms, Corporation Street, 6 p.m. Coventry Electric Club. Open forum on "The Future of the Electrical Industry." Supply: F. W. Godden, A.M.I.E.E. Contracting and installation: G. S. Nott. Retailing and marketing: G. R. Marson. Manufacturing: N. M. Hill, M.I.E.E.

Wednesday, September 5th.—*London.*—At Institution of Mechanical Engineers, Storey's Gate, 6 p.m. Institution of Heating and Ventilating Engineers. "Thermionic Valve Control of Heating and Ventilating Installations," by S. B. Jackson.

Saturday, September 8th.—*Wakefield.*—Strafford Arms, 5 p.m. Association of Mining Electrical and Mechanical Engineers (Yorkshire North-West Branch). Presidential address by J. M. Langley.

Saturday, September 15th.—*Manchester.*—Engineers' Club, 3 p.m. Association of Supervising Electrical Engineers (Manchester Branch). "Motor Control Gear," by Mr. Mathieson.

Radar in Production

Names of Manufacturers Mainly Responsible

DURING the war years the British radio industry increased fivefold and last year, despite competing claims on manpower, it employed about 250,000 persons. About 38 million valves of 600 types were then produced for the three Services. Particulars officially released last week indicate the influence of radar on this expansion.

The first demand was for a chain of radiolocation stations and in 1937 the first contracts were secretly placed with a few manufacturers. Transmitters were made the responsibility of the Metropolitan-Vickers Electrical Co., Ltd., and receivers of A. C. Cossor, Ltd., and these, with Pye, Ltd., met the major part of the needs of R.A.F. ground radar stations. Airborne sets were in the main products of the General Electric Co., Ltd. (which also worked on the valves for the early radiolocation ground chain), the Gramophone Co., Ltd., E. K. Cole, Ltd., Bush Radio, Ltd., Pye and Cossor.

Equipment for the Navy

For the Navy, Allen West, which had had no previous connection with radio, built as a rush "job" (without working drawings) the early radar sets needed for detecting submarines for destroyers or corvettes. A second achievement of this firm was the speedy manufacture of mobile units to give early warning of low-flying enemy aircraft off the coasts; similar units were fitted to ships with aerials stabilised by Ferranti, Ltd., the Metropolitan-Vickers Co. and W. A. Bentley for coping with the rolling of the vessels.

Direction-finding stations for watching for ocean raiders in the Atlantic and similar equipment on convoy escorts were developed by the Marconi Co. and the Plessey Co. Long-range warning of aircraft was provided for large warships at the beginning of the war by Aeronautical and General Instruments, Ltd., Pye, Ltd., and Allen West, and in 1941 equipment for small vessels was being produced by the first-named together with Marconi's, Murphy Radio and E. K. Cole. Power was obtained from motor-generators with appropriate control gear, electrically separate from the ships' mains supply systems, provided by Whipp & Bourne, the British Thomson-Houston Co., Newton Bros. of Derby, and E. N. Bray.

Since 1939 naval guns have been changed over from optical to radar ranging with greater and continually improving accuracy. Transmitters were made by the B.T.H. and G.E.C., the latter with Pye also supplying the receivers; cathode-ray indicators were provided by Cossor, Parmeko and Ferranti. From 1941 onwards the Metropolitan-Vickers and Marconi companies were responsible for improved devices measuring range accurate to a few yards, while the beam switch for "blind" firing was made by E. F. Moy and a very accurate potentiometer by Painton & Co. In making the radar set an integral part of the gun assembly, contributions came from E.M.I., Gramophone Co., Allen West, Marconi, B.T.H. and Ferranti.

On land as a result of the equipment of ground control stations, night fighters, A.A. guns and searchlights with radar, heavy enemy raids on this country ceased in May, 1941, although considerable delay had been caused by the destruction of most of the transmitter components of new designs at Siemens' Woolwich works in the previous September. One of the later versions of night-fighter equipment, a G.E.C. centimetric set was, in view of urgency mostly made by small firms and garages.

Gun-laying

Ground radar for the Army was developed from the earliest days by Cossor and other large firms. In 1939 Metropolitan-Vickers and the Gramophone Co. were engaged in the construction of gun-laying equipment; this weighed over a ton and incorporated 60 valves and 122 gears, and 80 per cent. of the labour employed was unskilled. In 1943 the B.T.H. Co. designed an improved model and after three months was producing ten a week. A searchlight direction system was made by Murphy in large quantities.

The first offensive use of radar (and the first airborne type) was the air-to-surface-vessel sets carried by Coastal Command made by E. K. Cole and Pye in 1939. In 1943 "H2S" sets, which reproduce as on a map the terrain over which the aircraft is passing, were modified and diverted from Bomber Command to Coastal Command.

One of the greatest aids to accurate night bombing was "Gee"—a system in which time differences in the receipt of signals from three or more stations are used to fix the position of the receiving station. It enabled bombers to assemble in saturation strength and to navigate accurately under all conditions of light. M. A. P.'s Telecommunications Research Establishment guided its development at Cossors' shadow factory and with Dynatron Radio, Ltd. (a firm in a private house) produced the first 500 units early in 1942, the small concern making two-fifths of the output. Cossors then joined in for bulk production. Crystals for the "Gee" circuit were provided by the Post Office Research Establishment. More than 11,000 aircraft were thus equipped and by VE day 2,000 sets a month were being delivered to Allies.

The elaborate ground-guided bombing system known as "Oboe," introduced in 1943 principally to enable pathfinders to drop their flares, was produced by Metropolitan-Vickers and Standard Telephones, with Cossor, Dynatron and the G.E.C. also contributing quotas. Finally the bomber was freed from dependence on ground radar stations by H2S, which gave a direct picture of the unseen earth's surface at night or through cloud. The major proportion of the work was done by Nash & Thompson, Ltd., and the Gramophone Co., which had collaborated with the Telecommunication Research Department in the initial stages. By the end of the European war seven out of every eight Bomber Command aircraft had H2S. The system was adapted for naval conditions by the Decca Radio & Television Co.

The above account covers only a few of the radar devices that have been used, but mention must be made of the method of identification of friend or foe (I.F.F.) which enabled allied aircraft to operate freely by day or night. This was developed and mass-produced principally by Ferranti's. In addition to the companies named, indispensable aid in the manufacture of components was received from the Philips organisation, Telephone Manufacturing Co., Telegraph Condenser Co., Dubilier Condenser Co., Morgan Crucible Co. and Erie Resistors, Ltd. Polythene cables introduced by Imperial Chemical Industries were developed by the Telegraph Construction & Maintenance Co., which disclosed its technique to other cable manufacturers. These cables helped greatly towards the adoption of very short wavelengths, which marked a vitally important stage in radar development.

Principles of Radiolocation

Sir Edward Appleton's Kelvin Lecture

THE following is an abstract of the 36th Kelvin Lecture which was delivered by Sir Edward Appleton (Secretary of the Department of Scientific and Industrial Research) on April 26th, 1945, at the Institution of Electrical Engineers. Considerations of secrecy have prevented earlier publication.

Sir Edward Appleton

Radiolocation may be defined as the process of locating the position of an object in space by radio waves without any active co-operation on the part of that object. The only co-operation required on the part of the detected body is the ability to reflect radio waves, as all solid and liquid bodies do. Radio waves are, in general, uninfluenced by darkness, clouds or fog. Ground detectors pick up the reflected beam from the aircraft, enabling the *direction* of arrival of the reflected waves and thus of the radio-located object with respect to the ground station to be determined. This alone cannot give the true position of the source and the essential feature of radiolocation is the ability also to determine the actual *distance* away along that direction.

The method employed for determining this distance is to time the journey of the radio waves to the reflecting object and back, just as seamen time an echo of a ship's whistle to ascertain roughly their distance from the face of a cliff. Radio waves, however, travel at 186,000 miles per sec.—about a million times the speed of sound—and it is the accurate and speedy measurement of time-intervals of this order which is the basic feature of radio measurement of distance.

The first experiments on these lines were carried out in 1924 by two Cambridge physicists, E. V. Appleton and M. A. F. Barnett in their experimental proof of the existence of the Heaviside layer and the measurement of its distance above ground. In these experiments, which were carried out at B.B.C. stations under the auspices of the Radio Research Board of the Department of Scientific and Industrial Research, the timing of the radio waves to the reflecting Heaviside layer and back was achieved by changing the frequency of the waves by a known amount, nowadays called "frequency-modulation." Shortly afterwards G. Breit and M. A. Tuve, in Washington, measured the height of the Heaviside layer using amplitude modulation of the radio waves. They devised a radio transmitter which sent out very short pulses, or jabs, of radio energy and recorded the time interval between the emission of a pulse and the reception of its echo on a high-speed galvanometer. The pulse method, because of its simplicity, has been widely used later in the measurement of the distance of artificial targets such as aircraft and ships.

The pulse-method was simplified in 1931 by the introduction by E. V. Appleton and G. Builder of the cathode-ray oscillograph with an associated uniform time-scale. This enabled the presence of a reflecting object and the indication of its distance away to be continuously portrayed without having to develop photographs.

Detection of Aircraft

In 1932 the engineers of the British Post Office reported the first recorded instance of the detection of the presence of aircraft by reflected short radio waves. In the following year, engineers of the American Bell Telephone Laboratories published an account of experiments showing that aircraft, even when invisible, reflected sufficiently appreciable quantities of radio energy for their presence to be detected. The military application of position-finding with high-powered detectors was begun in 1935 by Sir Robert Watson Watt and Messrs. L. H. Bainbridge-Boll, E. G. Bowen and A. F. Wilkins, at an Air Ministry Station on the East Coast of England, with the result that radiolocation sentinels for the detection of aircraft were ready when war broke out in 1939.

Radio distance finding by reflection has already provided a vast fund of knowledge concerning the electrical reflecting layers in the upper atmosphere from which the most suitable wave-lengths can be predicted for communicating over various distances at different times in different parts of the world. Further work is now in progress in England on the location of meteor trails by means of radio reflections. Also calculations show that with sharp focusing at very powerful sending and receiving stations, radio echoes should be detected after radio waves have made a 2½-sec. journey to the moon and back.

D†

Municipal Reports

Nottingham

THE 1944-45 report of Mr. G. H. Lake, city electrical engineer and general manager at Nottingham, records a decrease of 10·3 million kWh in supplies by contract but sales to all other classes of consumers increased and the total of 217·3 million kWh sold was 2 per cent. more than in the previous year. Due to plant being out of commission for maintenance the output of the generating station dropped by 19·3 per cent. to 321·6 million kWh and exports to the C.E.B. were reduced from 130·8 million to 49·9 million kWh.

The total income of the Department was £1,065,292 (against £997,755) and working expenses were £818,111 (£735,193), there being a net profit of £11,336 (£12,211). From this a sum of £8,500 has been allocated to rate relief which, with a contribution towards central administration costs included in working expenditure, makes a total of £24,500 as in previous years. The average price obtained per kWh sold was 1·16d. against 1·11d. in 1943-44.

Mansfield

Although no new war industries of any magnitude were brought into the area of supply of the Mansfield undertaking to create loads of any size the total number of kWh sold in 1944-45 was 72 per cent. greater than in the year immediately before the outbreak of war. The report of the undertaking engineer (Mr. A. Latham) also records that during the war the 3,000-V and 11,000-V switchgear at the electricity works has been entirely replaced, necessitating the erection of a new switchroom, while alterations to the bulk supply feeders involved the establishment of a 33,000-V substation. The five-year programme of post-war works is estimated to require capital expenditure amounting to £271,730.

Last year the total revenue amounted to £110,371, against £102,423 in 1943-44, and the net profit was £2,247 (£1,105). A total of 17·6 million kWh was sold (16·6 million) at an average price of 1·457d. (1·438d.).

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Concerning Trams

AN initial reading of Mr. Grierson's letter in your issue of July 20th makes one wonder whether his personal opinions and experiences are not possibly amongst those exceptions which prove rules, for, to take tramway smashes, he has heard of one, but it happened as long as twelve years ago. Again, his castigation of the conduit slot is made without acknowledgment of the fact that the conduit is not part of a truly modern tramway.

That a possibly dangerous electrified wire needs an insulating covering to make it almost perfectly safe is no argument against the use of electricity; similarly with the tram and its lifeguard. Moreover, some accident figures for L.P.T.B. vehicles (1942) may be of interest:—

	Fatal accidents.	Car miles, millions.	Non-fatal.	Car miles, millions.
Trams	18	0·58	1,740	56·1
Trolley-buses	61	0·89	4,096	59·7

Two points arise: One, that the trams are NOT modern ones and are denied all the advantages of reserved track and of loading islands in street sections; secondly, these are published facts and not mere opinions. Operators of undertakings having reserved tracks (*e.g.*, Glasgow) are unanimous in declaring that accidents are virtually unknown on such sections.

Mr. Grierson states that trolley-buses are 25 per cent. cheaper to run than trams. This is difficult to reconcile with the fact that the cheapest fares in the country are found in those cities with modern tramways—Glasgow, Sheffield, Leeds—and even in backward London 9d. return fares exist still on trams but are absent from their railless successors!

East Molesey. R. KIRKLAND.

IT would be interesting to know how Mr. Grierson derives his figure of 25 per cent. for the operating economy of the trolley-bus as against the tram. Surely, if this were so, fare tariffs would reflect this difference, but they do not, rather the reverse being the case.

The following figures are the average for the year 1937-38 of those of several of the larger municipal undertakings where no large-scale conversion had taken place, and of several of the larger municipal trolley-bus undertakings, of which the relevant figures were published in both cases. On an average the passenger mile on a tram costs 0·66d. and on a trolley-bus 0·88d. Fares, therefore, are 25 per cent. in favour of the tram. Possibly Mr. Grierson means cost per vehicle-mile? Here the average is 12·0d. for the tram and 11·9d. for the trolley-bus, or about equal.

Just as an electricity undertaking offers "units," so does a passenger transport undertaking offer "seat-miles"; the cheaper they can produce their products, the better. Few trolley-buses seat over 70; most seat about 60. Few trams seat less than 60; most seat over 70 and some over 80. Hence, for equal vehicle costs we have lower seat-mile costs, the averages of these being 0·20d. for the tram and 0·23d. for the trolley-bus.

Detailed operating returns of passenger transport undertakings, a study of which would prevent misleading statements being made, are published regularly in normal times in periodicals of a transport nature. The figures for 1937-38 are the latest available to me and, as the cost of tyres has more than doubled since then, an analysis based on present-day figures would undoubtedly show a result more in favour of the tram. Even so, the figures given do show that your correspondent is trying to put his boot on the wrong foot!

Upminster. V. E. BURROWS.

Production Plant Maintenance

IN support of the criticisms made by Mr. H. Greaves in your issue of August 3rd regarding the poor technical quality of some electrical department managers and foremen and of their equipment, I can cite a number of instances. I have seen identical compound-wound DC generators running at between one-quarter and three-quarters full load because the foreman didn't know how to use an equalising connection (and wouldn't take advice), three-phase and single-phase circuits taken from the same fuse bridge in an over-crowded board and vaseline used as lubricant for ball and roller bearings.

In some cases nothing is done to prevent a recurrence of continuous trouble that has

been experienced with suds pumps, four-speed drill motors, ventilating fan motors, and slipring motor starters. In another instance no attempt at equipment standardisation has been made; on three identical machine tools, different makes of starters are in use. It is considered normal for a fault on a final machine circuit fuseboard to shut down a whole department by opening a substation breaker.

Too often the departments are merely repair departments; no maintenance records are kept and the spares stock is inadequate. There is no thought of preventing breakdowns, and there are too few instruments, and no bridge "Megger" tester, tachometer or watt-meter are kept. Pulley and bearing removers are inadequate and worn, and a lack of ladders causes much waste of time.

In three factories at which I have worked, two had between 6,000 and 8,000 employees, and electrical staffs of thirty men or so. However skilled and well paid the electrician may be, departments like these cannot give adequate service. In such cases employers have no opportunity of realising how consistent and reliable electrical service can be.

WORKING ELECTRICIAN.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE trustees of the Beit Scientific Research Fellowships have awarded fellowships at the Imperial College of Science and Technology during the academic year 1945-46, and renewable for a second year. They include one awarded to K. D. Froome, B.Sc., A.Inst.P., for research on the mechanism of very high current conduction in gases, under the direction of Professor Sir George P. Thomson, F.R.S., and another to D. K. C. MacDonald, M.A., Edinburgh, A.Inst.P., Graduate I.E.E., for research on noise and sensitivity problems in radio engineering, under the direction of Professor C. L. Fortescue, O.B.E., M.A., M.Inst.C.E., M.I.E.E.

Major H. S. Davidson, A.M.I.E.E., has returned to the Central England District of the Central Electricity Board after serving with H.M. Forces since the outbreak of the war. He has been appointed transmission engineer.

Mr. W. M. McKenzie has been appointed assistant secretary of Bruce Peebles & Co., Ltd.

Mr. F. L. Sharpe has resigned from the board of Vactric, Ltd.

Mr. W. F. Taylor sales manager of the Telegraph Condenser Co., Ltd., has joined the board of directors. He has been with the company for twenty years and has occupied several positions in the organisation.

Mr. W. F. Taylor

Dr. W. T. Griffiths, F.R.I.C., F.Inst.P., has been appointed chairman of the Mond Nickel Co., Ltd., and of its subsidiary companies, in succession to the late Mr. D. Owen Evans, M.P. Dr. Griffiths was for many years head of the company's Research and Development Department.

Having been with his undertaking for nearly forty years, **Mr. Ernest J. Nichols,** M.I.E.E., city electrical engineer of York, can claim a fair share of the credit for the remarkable electrical development of the York area described in this issue. He went to York in 1906 as mains assistant, being promoted to chief assistant in 1911 and city electrical engineer in 1922. Previously he was senior charge engineer at Newport, Mon., and shift charge engineer at Partick. A native of London, Mr. Nichols went to Bancroft's School, Woodford, and received his technical training at Faraday House.

Mr. E. J. Nichols

Commander Philip Baker, O.B.E., R.N. (ret.), has been appointed public relations officer to the British Export Trade Research Organization. Before the war he acted in a similar capacity to North Eastern Trading Estates, Ltd.

Mr. D. Watkins has been appointed joint managing director of the British Vacuum Cleaner & Engineering Co., Ltd.

Mr. W. S. Thain has been appointed general manager of Wood & Cairns, Ltd., electrical and radio wholesalers, Edinburgh. He was formerly joint manager of the Dundee branch of Thomson & Brown Brothers, Ltd.

In our issue of August 3rd last we reported that **Mr. E. Taylor** had been appointed electrical engineer with Simon-Carves, Ltd., being responsible for the electrical side of the company's contracts. We are informed that this applies only to the boiler department, and that **Mr. C. R. Plant** is electrical engineer of the coke-oven and washer department.

Obituary

Mr. J. S. Highfield.—We deeply regret to record the death on August 15th at the age of seventy-three of Mr. John Somerville Highfield, senior partner in Highfield and Roger Smith, consulting engineers. Mr. Highfield was a past-president of the Institution of Electrical Engineers and last year he was elected an honorary member in appreciation of his distinguished work in the development of the science of the supply and application of electricity.

The late Mr. J. S. Highfield

After serving as an assistant in the Manchester Corporation Electricity Department at the time when Dr. John Hopkinson was introducing the five-wire system of distribution, Mr. Highfield became chief engineer of the Stafford electricity undertaking. Later he held the position of chief engineer of the St. Helens undertaking and was then appointed chief engineer and manager of the Metropolitan Electric Supply Co., Ltd. He entered into partnership with his brother, the late Mr. W. E. Highfield, in 1921, and three years later the firm was joined by Mr. Roger Smith, formerly electrical engineer to the Great Western Railway. As senior partner in the firm, Mr. J. S. Highfield acted as consulting engineer for the Central Electricity Board and several large electricity undertakings and industries in this country and abroad, and he also became a director of the London Power Co., Ltd., London Associated Electricity Undertakings, Ltd., Central London Electricity, Ltd., etc.

In the field of electricity supply Mr. Highfield originated the closed-bar system for switchgear, discovered the reason for the failure of high-voltage alternator windings and, while chief engineer of the Metropolitan Electric Supply Co., introduced to England the Thury system of high-voltage DC controlled constant current generation and distribution, which was applied over a large area of West London. During the 1914-18 war he demonstrated at sea the use of shrouded hydroplanes for submarine detection.

Mr. Highfield was a Fellow of King's College, London, a past-president of the Association of Supervising Electrical Engineers and the Junior Institution of Engineers as well as of the I.E.E., a past manager and vice-president of the Royal Institution of Great Britain, a vice-president of the Royal Society of Arts and a member of the Société des Ingénieurs Civil de France. Besides his many technical contributions he was the author of papers on "Suggestions for a Trade Court" and "A Suggested Remedy in Unemployment Insurance."

Dr. Leslie Burgin, whose death occurred on August 16th after a long illness, was a former Minister of Transport (1937-39) and Minister of Supply (1939-40). Earlier he had held the position of Parliamentary Secretary to the Board of Trade.

Mr. S. J. Adams.—The death is reported at the age of sixty-one of Mr. Samuel James Adams, electrical contractor, Wellingborough.

Egyptian Electrical Industry

CONSIDERABLE progress was made during the war in the electrical side of the engineering industry in Egypt. A Department of Overseas Trade review of commercial conditions in the country (Stationery Office, 1s.) points out, however, that as there is no basic iron and steel industry to support Egypt's engineering industry, the activities of the latter are largely concerned with maintenance and the production of spare parts of machinery, although certain simpler electrical products are now being made, including batteries, of which there is at present a manufacturing capacity of 1,500,000 units of 1·5 V. A new factory under construction will be able to produce 3,000,000 electric lamp bulbs a year. Total imports of electrical machinery, apparatus and materials during 1938 amounted in value to £886,000, of which £217,000 came from the United Kingdom, £181,000 from Germany, £117,000 from the U.S.A., £108,000 from Belgium, £69,000 from the Netherlands and £65,000 from France.

Electrical Imports of Eire

SO far this year there has been a marked increase in the imports of electrical machinery and cognate material into Eire. The latest official figures are those for the six months to June last, during which period they attained a total value of £208,039, as compared with £110,634 in the corresponding half of 1944, an increase of £97,405 or over 88 per cent.

Class of Equipment	January-June 1944 £	1945 £
Electric motors	5,051	8,178
Electric measuring instruments and apparatus	6,399	391
Other electrical machinery	14,662	34,634
Vacuum cleaners	—	1,723
Dry batteries and parts	4,390	3,929
Electric fires, kettles, irons, etc.	3,299	5,898
Electric cooking apparatus and parts	2,133	1,738
Electric light fittings and parts	9,703	15,419
Electric wires and cables	6,361	23,182
Telegraph and telephone apparatus	5,006	23,775
Wireless sets, components and accessories	11,072	30,140
Other electrical goods and apparatus	42,558	59,032
Totals	£110,634	£208,039

COMMERCE and INDUSTRY

Easing Man-power Shortage. Simplified Industrial Equipment Licensing.

Releases from Industry and Forces

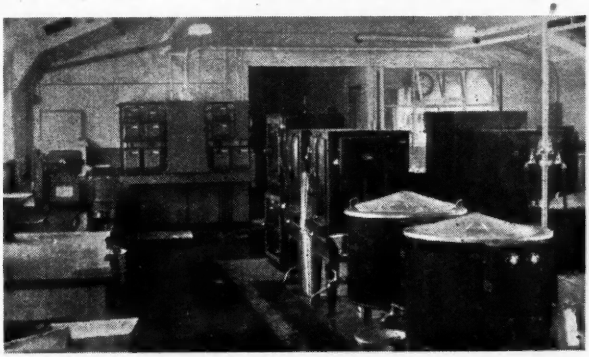
FOLLOWING Japan's surrender, the Prime Minister announced in the House of Commons last week that the Government estimated that in the next eight weeks well over a million people would be released from munitions. Demobilisation from the Forces is also to be speeded up and by the end of the year about 1,100,000 will return to civilian life, including 100,000 in Class B. Men and women who wish to leave their work must still obtain the permission of the National Service Officer if they are in jobs covered by any of the Essential Work Orders or in jobs to which they have been directed by the National Service Officer. Employers in establishments covered by the Essential Work Orders must still get the permission of the National Service Officer before workers are discharged.

School Catering by Electricity

Mr. J. H. Shepherd, borough electrical engineer of Harwich, has sent us details of two kitchens which the Ministry of Works has erected in his area for the provision of meals for school children. The central kitchen, from which meals are taken out in containers by van to various elementary schools, is designed to provide 750 meals. Besides two general-purpose ovens of 11 kW each and one of 5½ kW, there is a single-oven range (17 kW) and three steaming ovens (9 kW each) with four boiling pans (14 kW each). A steam-raising electrode boiler takes 36 kW and a hot-cupboard (7 kW). Other equipment includes a potato peeling machine (500 W), a mixing machine (750 W), a meat slicer (250 W), a refrigerator (250 W), three ventilating fans (250 W each) and lighting and heating points (3·8 kW). The total connected load is 177 kW, with an estimated maximum demand of 115 kW. Hot water is provided by a coke-fired boiler.

Each of the schools has a dining room and scullery for washing up, etc., the electrical equipment here comprising a hot-cupboard (7 kW), a 50-gal. water heater (9 kW), a rinsing sink (4 kW) and lighting and heating apparatus (2·47 kW), making a total connected load of 22 kW with an estimated maximum demand of 16 kW. The central kitchen has been in operation for a short time only and details of average consumption per meal, etc., are not yet available.

The High School has its own electric kitchen, suitable for 150 meals. A double oven range (24 kW), steamer (9 kW), hot cupboard (5 kW), boiler (7 kW), refrigerator and lighting (2 kW); making a total connected load of 47 kW. This kitchen has been in operation for several months and although the staff was entirely new to electric cooking, the results over the first few months, including the period of very cold weather when the hot-cupboard was used as a radiator to warm the kitchen, show the consumption to be approximately ¼ kWh per meal.



Some of the electrical equipment at the Harwich central kitchen for school meals

Industrial Electrical Equipment

The Ministry of Supply announces a considerable simplification and relaxation of the licensing procedure for industrial electrical equipment and the Control of Industrial Electrical Equipment (No. 4) (Revocation) Order, 1945, has been issued for this purpose. As from August 20th it will no longer be necessary for an acquirer to obtain a licence before placing an order for any industrial electrical equipment.

A system of selective control, similar to that now applying to metal working machine tools, has been introduced to take care of Service and other essential requirements for certain items where the supply position does not permit of complete relaxation of licensing. These items appear on a nominated list and orders for them can only be accepted by suppliers under the authority of a supply licence issued by Machine Tool Control, except where the transaction is covered by one of the exemption clauses. The present nominated list comprises DC motors, DC and AC generators, static condensers for p.f. correction and automatic voltage regulators.

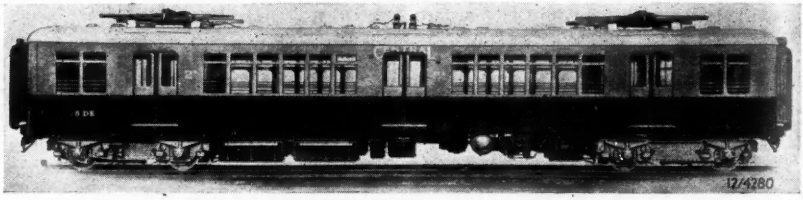
Preparatory Development Work

Manufacturers who wished to undertake preparatory work for post-war trade had hitherto to make individual application to the Board

of Trade. In future it will no longer be necessary for manufacturers to obtain this specific authority before undertaking preparatory development work of this kind, but firms will still have to obtain licences for raw materials required for development work and for actual manufacture where this is at present subject to control.

Brazil Railway Contracts

In 1935 the Central Railway of Brazil placed a contract with the Metropolitan-Vickers Electrical Co., Ltd., for the first stage of the electrification of that system. This included the supply of sixty three-coach electric trains, two substations, transmission and overhead line gear, supervisory control, electric signalling and track circuiting installation and complete workshops, car sheds, etc. The whole of this work was completed before the war but the continuation of the programme had to be postponed on the outbreak of hostilities. With more normal conditions this programme is being resumed and an order, valued at approximately £1,000,000, has been placed with the company for an additional thirty three-coach trains, extensions to two substations and considerable spares. The three-coach trains, as before, comprise a motor coach with a driving trailer-coach at each end. The motor coaches will be generally duplicate of that illustrated, equipped with four 1,500/3,000-V, 175-HP motors. The coaches are of all-steel construction, and are of non-compartment type. The three coaches are connected together as a unit and can be operated in a train of two or more of these units.



Metrovick electric motor coach supplied to Central Railway of Brazil

Contract Price Adjustment Formulæ

The latest figures for the B.E.A.M.A. contract price adjustment formulæ are as follows:—(*a*) Rate of pay for adult male labour at August 11th, 95s. (unchanged). (*b*) Costs of material: the index figure for intermediate products last published by the Board of Trade on August 11th is 182·5 and is the figure for the month of July; this compares with 181·9 for June.

Radio Receiver Production

The first peace-time radio sets are likely to be available in the autumn, but not until well into 1946 will any substantial inroad be made into the large public requirements. The first post-war sets will be very similar to models in the immediate pre-war ranges and will bear manufacturers' trade marks. Labour and material costs and purchase tax are likely to make the prices considerably higher than the immediate pre-war models, but a large proportion of the total number of sets produced will be sold at £15 or under, excluding purchase tax.

United States radio manufacturers are to be authorised to devote half their pre-war capacity to civilian production during the last three months of this year and nearly their full capacity in the first quarter of 1946. Production of the radio and electronics industry may not reach the authorised level because of shortages of raw materials, component parts and manpower. More than 5 million home radio sets are, however, expected to be produced between October 1st and March 31st next.

Witton Development Laboratory

The Witton Development Laboratory of the General Electric Co., Ltd., recently arranged a conversazione to which 600 members of the administration and production staffs of G.E.C. works in the South Midlands area were invited by Dr. W. Wilson, chief of the laboratory. The principal object of the function was to give the visitors an insight into the work of the laboratory and an opportunity to inspect the wide variety of investigations which are being made at the present time. The increasing use being made of electronic apparatus was a notable feature of the many demonstrations and considerable interest was taken in the complete control of motors by thermionic valves. Special interest was also taken in the welding section, where new techniques in connection with both carbon and metal electrode welding were demonstrated. The insulation section showed a new method of automatic high-speed treatment of rotors by means of synthetic impregnants and infra-red heating.

Exports from Latin America

As a supplement to the brochure issued a year ago entitled "Post-War Markets in Latin America" the Bank of London & South America, Ltd., 6-8, Tokenhouse Yard, London, E.C.2, has now published a second booklet called "Post-War Exports from Latin America."

Consumption of Non-Ferrous Metals

Following the issue by the Ministry of Supply in June last of detailed figures of the consumption in the United Kingdom during the war years of the metals within the scope of the Non-Ferrous Metals Control, figures for the second quarter of 1945 are now available. The total con-

sumption of virgin metal in the first and second quarters respectively (in tons) was as follows: copper, 81,103 and 72,378; zinc, 45,411 and 43,109; lead, 51,517 and 55,265; tin, 3,949 and 4,067; nickel, 2,431 and 2,214; cadmium, 114 and 121; antimony, 1,265 and 1,348; cobalt, 195 and 168; and manganese, 144 and 134. Over the first half of 1945 consumption in most metals (especially copper and nickel) was below the 1944 level, reflecting the reduced demand for munitions.

Copper Decontrolled

All restrictions on the release of copper for fully manufactured goods for export have been removed by the Non-Ferrous Metals Control.

A.S.L.I.B. Conference

The 1945 conference of the Association of Special Libraries and Information Bureaux will be held during the week-end September 15th-16th at the Portland Hall, Little Titchfield Street, W.C.1. On the preceding Friday evening a conversazione for members and guests will be held at the Royal Institute of British Architects. The opening address on "Information service as an essential factor in the progress of science," will be given by Professor J. D. Bernal. Further details may be obtained from the Association's offices, 52, Bloomsbury Street, London, W.C.1.

Packaging Restrictions Relaxed

The Control of Containers and Packaging (No. 3) (General) Order, 1945 (S.R. & O. 1945 No. 941) relaxes a number of restrictions on packaging.

Care of Boiler Plant

Fuel Efficiency Bulletin No. 41 issued by the Ministry of Fuel and Power Committee on the Efficient Use of Fuel is entitled "How to Look After a Boiler Plant." Indicating the order of the various stages of examination to be followed, the leaflet is intended for use in conjunction with other Fuel Efficiency Bulletins, "The Stoker's Manual" and "The Efficient Use of Fuel" also issued by the Ministry.

Bristol Engineering Exhibition

From September 7th to 15th the Bristol Engineering Manufacturers' Association is organising an exhibition of engineering products at the Victoria Rooms, Bristol. The Association, a local body of nearly 200 engineering firms, has been established to render mutual help to each other and to pursue collective marketing projects where possible. The exhibits will include the latest developments in electric welding processes, kitchen units, washing machines and cookers.

Linesman's Death

The circumstances in which a Middlesbrough linesman, Ronald Samuel Midgeley (37), met his death were investigated at a recent inquest.

James Atkinson, linesman's mate, said that during the morning they received the usual notification by card from the substation at Aycliffe that the line was "dead," but they had gone to the wrong line by mistake. Midgeley climbed the standard to inspect the lines. He was not wearing protective clothing or gloves, and on reaching the top he touched a wire; there was a flash and he fell to the ground.

Fred Collison, chargeman employed by the North Eastern Electric Supply Co., Ltd., said that during the morning the assistant engineer at the substation gave him the permit card certifying that the line was "dead" between Aycliffe and Spennymoor Close. On arriving he found the pole was marked Spennymoor Close and he assumed that it was the right pole. He thought he was justified in setting Midgeley to work on that pole.

Recording a verdict of "Accidental death," the coroner exonerated Collison and said that the markings on the pole had led to Midgeley's death. It was obvious that something had gone wrong.

Power Station Fatality

A verdict of "Accidental death" was returned at an inquest on John Gilchrist (48), who was killed by an explosion while testing a condenser at Littlebrook power station, Stone. It was stated that the main door of the condenser was blown off while an air test was in progress. The cause of the explosion was said to be unknown.

Trade Announcement

A. J. Evans & Son have opened a wholesale trade counter and stores at 3, Fulbourne Street, Whitechapel, London, E.1, for the distribution of electrical accessories, switchgear, lamps, etc. The company's registered office remains at its Holborn address.

Trade Publications

Wild-Barfield Electric Furnaces, Ltd., Watford By-pass, Watford, Herts.—Illustrated brochure (ESB. 1044) specifying electrode salt baths of the "ESB Minor" design for single- and multi-unit installations for the heat treatment of metals.

Cressall Mfg. Co., Ltd., Eclipse Works, 31-32, Tower Street, Birmingham, 19.—Two leaflets relating to resistances and regulators for all purposes.

Applicants for copies of these publications should write on business letter-headings.

TRADE MARKS

THE following applications have been made for trade marks. Objections may be entered within a month from August 15th :—

SILEX. No. 630,597, Class 9. Electric steaming and pressing irons, electric coffee makers; and parts thereof not included in other classes. The Silex Co., 80, Pliny Street, Hartford, Connecticut. Address for service: c/o Frank B. Dehn & Co., 103, Kingsway, London, W.C.2.

BW (design). No. 634,360, Class 9. Electric soldering irons. Also No. 634,361, Class 11. Installations for lighting, heating, steam generating, cooking, refrigerating, drying, ventilating, etc. Barlow-Whitney, Ltd., Coombe Road, Neasden Lane, London, N.W.10.

ZEPHYR. No. 634,907, Class 11. Hair-drying appliances. Apex Hairdressing Equipment Co., Ltd., 64, Frith Street, London, W.1.

Trade with Scandinavia

Bank's Review of Prospects

POST-WAR prospects for trade between Great Britain on the one hand and Sweden, Norway, Finland, Denmark and Iceland on the other are reviewed in a booklet issued by Hambros Bank. In the opinion of that organisation these countries will present opportunities for new and expanded markets, but if the opportunity is to be taken, not only the goods but the right goods must be delivered. In illustration it is pointed out that it would be foolish to export the British bayonet-cap electric lamp when these countries use the screw-cap type.

Imports of electrical goods from Great Britain have not been substantial in the past. The figures given in the booklet are not detailed, but they include an interesting comparison with imports from Germany. Swedish imports in 1938 of "machinery, electrical material, etc." totalled £11,786,000 in value with Germany responsible for £5,452,000 and Britain £1,351,000. Danish imports of "electrical machinery, etc." in the same year were valued at £1,247,000, Germany being represented by £741,000 and Britain by £257,000; while Iceland's total was £95,000—Germany £44,000 and Britain £30,000.

Norwegian Electrical Imports

For Norway and Finland Hambros do not give figures of the electrical trade. But according to the Norwegian Chamber of Commerce in London, imports into that country from the United Kingdom in 1938 of electric motors and parts were £14,500 in value, dynamos and parts £5,000, radio-receiving apparatus £14,700, loudspeakers £5,200, valves £7,300, other radio apparatus £19,350, telephones, etc. £40,000, accumulators and parts £14,000 and other electrical machinery and apparatus £15,100. There is evidence that the British share of the electrical trade as a whole was only about 5 per cent. Germany and Sweden were by far the leading suppliers of electrical machinery and apparatus, though Holland came first in radio goods and Denmark in dry batteries.

For Finland the latest statistics relate to 1937. Then import values were:—Electrical machinery £640,000, metal-sheathed electric cables £134,000, Britain's share being respectively 4·5 and 0·7 per cent. More than half the cable trade was done by Germany. In the year under review the manufacture of electric motors was expanding and amounted to 5,600 units. The output of accumulators and radio apparatus also was developing.

Some of the remarks in Hambros' booklet regarding trade generally with these Northern European countries will interest the electrical exporter. For instance, it is pointed out that although Sweden makes machinery, tools and accessories herself, there is little doubt that the war created an interest in British goods, and a study of the types she has to import will well repay British industrialists. In particular the Swedes would welcome labour-saving devices for their modern flats and houses. Radio sets should find a sale.

With regard to Denmark there is a reminder of the spontaneously initiated "Buy British" movement in the late 'twenties—a movement which, the booklet says, persisted during the German occupation, inasmuch as although stocks of British goods were exhausted, the shop-window posters with the words "English Style" or "English Fashion" remained as a souvenir of the free days of goods of high quality. It would seem that prospects of importing British electrical manufactures connected with farm and allied operations are worth investigation. Hambros recommend British firms to take part in Danish trade exhibitions.

Finland's Needs

While in Finland there will be a restriction for some time on the import of all luxury articles, there will be a need for all kinds of machinery, tools and accessories. The pre-war rising standard of living will in all probability have to be curtailed, but if past experience is a good guide, there can be no doubt of the country's vitality and recuperative power.

Norway's trade with Britain calculated per head of population is greater than that of any other country, New Zealand excepted. But her purchasing power at present and in the near future is very uncertain owing to shipping losses and war damage to industry generally. In import trade long-term and reasonable credits will be required. In view of the prospective activity of Norway's shipbuilding yards in building the smaller types of vessels, certain kinds of electrical gear may be needed. Iceland will want to buy electrical plant and will favour a country that buys her products.

New Zealand Development Plan

THE Budget announced by the New Zealand Minister of Finance refers to a national development programme, covering electric power, housing, and the settlement of soldiers on the land, which will be financed by a loan of £16,650,000 from the Government lending departments. It also sets out at length the production and trade policy which is to be followed. New Zealand must, it is stated, build up exports to pay for imports, and encourage manufacturing in order to provide employment. In establishing new industries New Zealand will give United Kingdom industries an opportunity to submit proposals.

ELECTRICITY SUPPLY

Additional Plant in North-East. Algerian Development Programme.

Brierfield.—SUBSTATIONS.—The electrical engineer is applying for sanction to borrow £5,000 for two new substations.

Broadstairs.—STREET LIGHTING PLANS.—The Urban District Council has decided to modify its long-term policy for street lighting in view of the estimated cost. Last February the Council approved a scheme submitted by the Isle of Thanet Electric Supply Company for the whole of the district. A report by the surveyor states that this scheme would involve the erection of 1,463 lamps against the 689 in use in 1939, the estimated cost per annum being £14,395 against £4,046. He has submitted a smaller scheme providing for 773 lamps at a cost of £7,279. The chairman of the Street Lighting Committee (Councillor F. J. Malpress) has assured the Council that lighting in the town will be improved as materials and labour became available.

Durham.—POWER STATION SCHEME.—The Minister of Town and Country Planning has been informed by the North-Eastern Electric Supply Co., that, in an endeavour to mitigate the effects of the delay which has taken place in regard to its proposal to erect a £3,500,000 generating plant at Kepier on the outskirts of the city, it has already taken steps to meet the present demand for additional supplies of electricity by installing plant elsewhere. Opponents of the Kepier scheme had contended that it would spoil the view of Durham Cathedral and Castle, and destroy the medieval charm of the city.

Stockton-on-Tees.—SUBSTATIONS.—The Town Council is to place contracts shortly for the erection of three substations.

YEAR'S WORKING.—The annual report of the Corporation's electricity undertaking shows a net profit of £572. The total income was £147,196 and working expenses were £115,635.

West Hartlepool.—TRADING RESULT.—The accounts of the Electricity Department for 1944-45 show a net profit of £7,432, which has been transferred to reserve.

Overseas

Algeria.—ELECTRICAL DEVELOPMENT PROGRAMME.—A plan has been drawn up for the development of electricity supply in Algeria. Among the proposals are the completion of nine hydro-electric plants under a programme initiated in 1940, the construction of three other small plants, the harnessing of two waterfalls at Small Kabylie, the construction of a modern thermal station at Oran and the completion of miscellaneous networks and the Algerian-Moroccan interconnection. When these projects have been carried out, the hydro-electric output in normal years will be approximately 400 million kWh.—*Reuter's Trade Service.*

France.—SUPPLY PROSPECTS IN PARIS.—Preparing for the coming winter, the Paris Electricity Distribution Company has expressed the hope that restrictions, such as existed last winter, will not be necessary. There is no possibility of the rationing scheme being suspended, but it is unlikely that the supply will be switched off for hours during the day. Manufacturers of domestic apparatus are endeavouring to provide the public with the most necessary electrical appliances. It is not yet decided whether the city of Paris will undertake a large-scale manufacturing programme to assure that certain essential apparatus is built as it did immediately after the 1940 armistice, when no less than 30 million francs was spent for this purpose. The C.P.D.E. emphasises that electricity should be used for domestic purposes during the low load hours, otherwise the supply to some districts may have to be cut off when the system becomes overloaded. It is considered that domestic supply should take precedence over shop-window lighting, the complete lighting of streets, etc., this winter.

Sweden.—POWER OUTPUT.—In the annual report of the Waterfalls Board it is stated that 4,984 million kWh was sold to consumers in 1944, an increase of 14·4 per cent. compared with 1943.—*Reuter's Trade Service.*

TRANSPORT

Brazil.—LEOPOLDINA RAILWAY ELECTRIFICATION.—The administration of the Leopoldina Railway is examining the possibility of electrifying its principal lines. According to projects under consideration the first electrified line should reach Caxias, Estado do Rio, and from there electrification is to progress to Petropolis and Campos.—*Reuter's Trade Service.*

Glasgow.—EXPERIMENTAL TRAM.—The Corporation transport manager has been authorised to construct an experimental double-deck tram having a separate entrance and exit on the near side.

Great Western Railway.—FLUORESCENT CARRIAGE LIGHTING.—Fluorescent tubes are being installed in place of the usual electric lamps in new passenger coaches now being built at Swindon.

Reading.—TROLLEY-BUS DEVELOPMENTS.—A five-year plan for the extension and development of the trolley-bus system has been approved by the Town Council. It includes eight suggested new routes or extensions of present routes, and according to a statement by the chairman of the Transport Committee (Councillor Bennet Palmer) further extensions will be considered when these are completed.

Sunderland. — ANNUAL ACCOUNTS. — The accounts of the Corporation transport undertaking for the year ended March 31st last record a total revenue of £210,784 and working expenses £166,716. After meeting interest charges, etc., there was a net balance of £42,805.

West Hartlepool.—PAST YEAR'S SURPLUS.—The Corporation transport undertaking shows a surplus of £13,643, including £3,275 on the trolley-buses and the remainder on the motor-buses.

Public Lighting Engineers

Forthcoming Conference at Glasgow

ON the occasion of the twenty-first anniversary of the formation of the Association of Public Lighting Engineers a conference is being held at Glasgow from September 11th to 13th.

A full programme has been arranged, including important matters concerning the future of street lighting. Chief among the subjects is an address by Dr. J. W. T. Walsh, who will outline the work of the drafting sub-committee responsible for preparing the B.S.I. Specification on Street Lighting to implement the M.O.T. Final Report of 1937. The document goes a long way to securing more economical street lighting and at the same time uniformity. Other speakers include Mr. J. M. Ward, deputy lighting engineer of Glasgow, who will describe in detail the city's street lighting. Mr. J. S. Smyth, B.Sc., will present a paper dealing with "Engineering Principles in Street Lantern Design," and others include "The Lighting of Bends, Junctions and Roundabouts," by Mr. F. F. Middleton, and "The Commercial Aspect of Public Lighting," by Mr. E. S. Harris, of the Gas Light & Coke Co. The presidential address will be given by Mr. E. J. Stewart, M.A., B.Sc. A further item of interest is an exhibition of street lighting apparatus and equipment which will be staged at the Corporation Lighting Department, 20, Trongate, Glasgow. Over 400 principal local authorities have intimated that they will be sending delegates to the conference.

West Midlands J.E.A.

Accounts for 1944

A STATEMENT of costs (bulk supplies) included in the annual accounts of the West Midlands Joint Electricity Authority shows that in the year ended March 31st, 1934, the average working expenses per kWh sold (275·5 million) were 0·201d. and total expenses, including loan charges, averaged 0·410d. per kWh sold. By 1936-37 these figures had fallen to 0·177d. and 0·332d. respectively (502·9 million kWh sold), since when there has been an upward trend, reaching 0·385d. and 0·512d. in the period covered by the latest accounts—the year ended December 31st, 1944—when a total of 978·7 million kWh was sold. Fuel costs, after dropping to 0·125d. in 1935-36, averaged 0·323d. in 1944.

Other statistics show that the total plant capacity at the end of the year (288,530 kW) was less than at the end of 1943 (300,076 kW). The maximum demand increased from 278,300 to 279,700 kW but energy generated fell from 1,133·5 million to 1,051·8 million kWh. A total of 934·0 million (against 902·6 million) kWh was sold to undertakings and 44·7 million (154·2 million) was exported to the C.E.B. Total income was £2,180,062 and there was a surplus for the year, partly estimated, of £14,850.

The accounts for the Authority's distribution area record a revenue from the sale of electricity of £377,974 and a total income of £379,989, there being a surplus for the year of £15,641. Consumers increased from 21,985 in 1943 to 22,460 last year, but sales of electricity which had risen from 24 million kWh in 1938 to 80·9 million kWh in 1943, decreased slightly to 79·3 million kWh.

E.R.A. Reports

Testing Finished Mouldings

A TECHNICAL report, B/T40, prepared by Messrs. B. Shearman, B. C. Fleming-Williams, Z. Rogowsky and D. J. Strong has been published by the British Electrical and Allied Industries Research Association at 34s. 6d. net.

The report describes a series of investigations to ascertain whether tests usually carried out on moulded materials with standard test-pieces could be made on miniature specimens cut from finished mouldings. The work was done at the request of the British Standards Institution with a view to preparing specifications to cover such tests as distinct from those on moulded materials.

Methods of cutting the mouldings are discussed and specimen sizes are suggested. Tests which could be applied to specimens obtained from mouldings were evolved for impact strength, cross-breaking strength, crushing strength, electric strength, surface resistivity, plastic yield with temperature, resistance to heat (glowbar), specific gravity and water absorption, and are described. The results obtained by these tests are compared with those of standard tests to see how far correlation is obtained, and tentative conclusions are drawn. Although suggestions are made for further work, it is considered desirable that this should be deferred until some experience has been gained on the use of the technique by interested parties.

Radio Frequency Heating

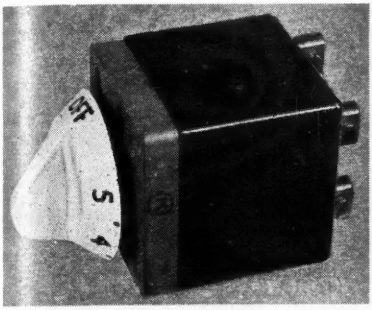
Another Technical Report (Y/T6, 9s.) under the title of "Capacity Current• Heating" summarises the information that has so far been published on this subject. The Report has been prepared by Mr. H. V. Onslow for E.R.A. in collaboration with Mr. T. H. Messenger and the Research Association of British Rubber Manufacturers. It deals with the theory of radio-frequency heating, briefly but lucidly, and in some detail, with its applications, the principal of which are rubber, moulded plastics, laminated wood and dehydration of food. Equipment and costs are also considered. A bibliography of 241 references is given.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

An Improved "Simmerstat"

AN improved model of the "Simmerstat" continuously-variable hotplate control is now available from SUNVIC CONTROLS, LTD., Stanhope House, Kean Street, London, W.C.2. Compared with the pre-war model, the unit



The new "Simmerstat"

is much more compact, being only 2¼ in. square by 2⅜ in. deep excluding the knob (compared with 3¾ in.). Its standard bush mounting and terminal arrangements enable it to be substituted for the ordinary 3- or 4-heat switch on any type of cooker within a few minutes. The price is only a few shillings more than that of a 3-heat switch.

Tool Lubricant Clarifier

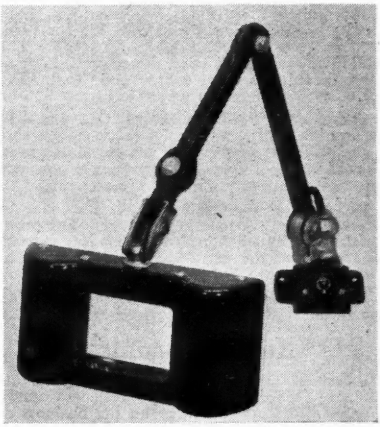
A clarifier is being made by ARTHUR SCRIVENER, LTD., Tyburn Road, Birmingham, which removes grit and swarf from the cutting lubricant of machine tools. The fluid enters a distributor tank through a restricted channel past a rotating aluminium disc on which is mounted a series of powerful magnets. The fluid then passes into the main chamber which contains a large wire basket surrounded by felt. Inside the basket is suspended a distributor pump for recirculating the cleaned liquid to the machine-tool. The aluminium disc revolves at a speed of from 1·5 to 5 RPM so that grit and swarf contained in the fluid passing through the restricted channel are attracted to the magnets and are thus carried round as the disc revolves to a position where wiper arms remove the particles, depositing them in a separate channel whence they are discharged into a bucket. The disc and pump are driven by independent AC motors of ¼ HP each. The clarifier weighs 2·75 cwt., its dimensions being 32 in. high, 36 in. wide and 19 in. from back to front; it has a capacity of 60 gallons per hour.

Illuminated Magnifier

A recent addition to the range of "E.D.L." industrial local lighting fittings offered by the ELECTRIC DEPOT, LTD., Pritchett Street, Birmingham, 6, is the "Lens-Lite" for inspection and close production work. The head contains two b.c. lampholders in miniature trough reflectors, one on each side of (and completely shielded from) the rectangular central viewing lens.

Balanced shadow-free illumination of the object is obtained in this way, normally by two 24-W 38-mm. bulbs energised from a 12/24-V circuit, but quite satisfactory light can be obtained from 15-W "Pigmy" lamps at ordinary mains voltage. The central viewing aperture can be fitted with optical glass lenses of alternative magnifying powers.

The moulded head, which measures 9 by 4¼ by 2 in. is attached to two hinged arms 9 in. in length terminating in a universal fixing base. The latter contains a single-pole



Magnifying viewer for illuminating close work

switch with a protected dolly and the wiring is threaded through the hinged arms. The protective glass screen may be clear or diffusing according to the user's preference.

Quebec Rural Co-operatives

Royal Assent has been given by the Lieutenant-Governor of Quebec (Sir Eugene Fiset) to a Bill authorising the expenditure of $12,000,000 for the setting up of electricity co-operatives to promote rural electrification in the Province.

FINANCIAL SECTION.

Company News. Stock Exchange Activities.

Reports and Dividends

Newton Brothers (Derby), Ltd., report a trading profit of £100,367 for the year ended March 31st, as compared with £174,048 in the preceding year. E.P.T. requires £76,484 less at £84,948 and the net profit is £13,645 (£13,431). The reserve account again receives £5,000, and research and development £1,378 (nil). The dividend is maintained at 17½ per cent. and £9,569 (£9,214) is carried forward.

The Engineering & Lighting Equipment Co., Ltd., shows a profit of £46,254 for the year ended March 31st last. The figure for the previous year was £31,215. The net profit was £21,357 (£21,454), income-tax and E.P.T. taking £7,917 (£7,123) and reserve for E.P.T. £16,000 (£1,775). A final ordinary dividend of 5 per cent. makes a total of 8 per cent. (10 per cent.) and £1,552 (£1,896) is carried forward.

The Victoria Falls & Transvaal Power Co., Ltd.—Speaking at the annual general meeting on August 14th, Mr. A. E. Hadley, chairman and managing director, said that the volume of business had been well maintained during the year, and the results showed an improvement.

The United River Plate Telephone Co., Ltd., reports a gross revenue of £5,408,733 for 1944, as compared with £5,125,875 for 1943. The final dividend is 2 per cent. (3 per cent.) making 7 per cent. (6 per cent.) and £4,182,141 (£3,603,953) is carried forward.

The Abitibi Power & Paper Co., Ltd.—In accordance with an order of the Ontario Supreme Court meetings of shareholders are to be held in Toronto early in October to consider the capital reorganisation of the company.

Richardsons Westgarth & Co., Ltd., are to maintain their dividend at 8 per cent. The profit for the year ended March 31st last was £62,880 (£63,396) and the carry-forward was increased from £58,933 to £79,348.

The North Eastern Electric Supply Co., Ltd., is maintaining its interim dividend at 2½ per cent.

New Companies

Industrial Cooling Equipment, Ltd.—Private company. Registered July 16th. Capital, £7,000. Objects: To carry on the business of manufacturers of, and dealers in, refrigerators, air and water cooled condensing units, cold storage plant, electrical and other machines, ice-cream making and food preserving machinery and ice boxes, dairy engineers, etc. Directors: F. Read, Tankerton, Styal Road, Wilmslow, and three others. Registered office: 123, Liverpool Road, Manchester.

Powell Refrigerating Services (Sheffield), Ltd.—Private company. Registered July 27th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, refrigerating apparatus, owners of cold storage chambers and ice stores and manufactories, heating, cooking, ventilating, electrical, gas and general engineers, etc. Directors: L. Powell and Mrs. E. Powell, both of 59, Westwick Road, Sheffield, 8. Registered office: 231, St. Philip's Road, Sheffield, 3.

Selgood Products, Ltd.—Private company. Registered July 17th. Capital, £500. Objects: To carry on the business of manufacturers and assemblers of, and dealers in, electric torches, batteries, radio, television and electrical equipment and components, hardware, etc. First directors: F. W. Bodger, Buckley Gate, Halifax, and five others. Registered office: Lombard House, Great Charles Street, Birmingham.

West London Telefusion, Ltd.—Private company. Registered July 11th. Capital, £5,000. Objects: To carry on the business of radio and television engineers, transmitters and relayers of programmes, manufacturers of, and dealers in, electrical, radio, television and cinematographic appliances, accessories and supplies, etc. Directors: J. C. Wilkinson, 67, Park Lane, Great Harwood and three others. Registered office: 31, Kingston Road, Wimbledon, S.W.19.

Holly Electric Motors, Ltd.—Private company. Registered July 28th. Capital, £500. Objects: To carry on the business of manufacturers of and dealers in petrol or electric automobiles, etc. Directors are: A. L. Deschuytter, 152, Fox Lane, N.13, and Mrs. A. Deschuytter, 40, Dawes Road, S.W.6. Registered office: 170, Bishopsgate, E.C.2.

Refrigeration Electrical Mechanical Engineering Services, Ltd.—Private company. Registered July 28th. Capital, £1,000. Objects: To carry on the business of electrical, wireless, refrigerating, heating and ventilating engineers, etc. Directors: J. Sullivan, 134, Strathmore Road, and S. Lockley, 61, John Street, both Hinckley, Leics. Registered office: Castle Street, Hinckley.

Gough Bros. (Electrical), Ltd.—Private company. Registered July 31st. Capital, £2,000. Objects: To carry on the business of electrical, motor, and wireless engineers, etc. Directors: I. B. Gough, 54, Quarrington Road, Horfield; A. E. Gough, 6, Radnor Road, Horfield; W. C. Wharton, 32, Southfield Road, Cotham, all Bristol. Registered office: 198a, Cheltenham Road, Bristol.

Korting Instruments, Ltd.—Private company. Registered July 30th. Capital, £2,000. Objects: To carry on the business of electricians and scientific instrument makers, etc. Directors: W. A. Bryce, 5, Lulworth Gardens, South Harrow and R. E. Blakey, 13, Half Moon Lane, Eccles. Registered office: 19-21, Shenley Road, Boreham Wood, Herts.

Barker & Wild, Ltd.—Private company. Registered August 7th. Capital, £1,000. Objects: To carry on the business of dealers in, and manufacturers of, electrical and mechanical plant and machinery, etc. Directors: A. W. Barker, 13, Langley Broom, Langley, Bucks, and H. J. Wild, New Butts Farm, Horton, Slough, director of H. J. Wild & Sons, Ltd. Registered office: Post Office Buildings, Colnbrook, Bucks.

Companies' Returns

Statements of Capital

Notting Hill Electric Lighting Co., Ltd.—Capital, £450,000 in 250,000 ordinary shares of £1 each and 20,000 preference shares of £10 each. Return dated March 20th. 135,250 ordinary and 20,000 preference shares taken up. £201,352 10s. paid, being 1s. per share on 27,050 ordinary and £10 per share on 20,000 preference. £133,897 10s. considered as paid, being £1 per share on 108,200 ordinary and 19s. per share on 27,050 ordinary. Mortgages and charges: £121,800.

Windsor Electrical Installation Co., Ltd.—Capital, £150,000 in £1 shares (65,000 ordinary, 50,000 5 per cent. preference, 25,000 7 per cent. preference and 10,000 undenominated). Return dated March 20th. 65,000 ordinary, 23,532 5 per cent. preferred and 25,000 7 per cent. preference shares taken up. £88,532 paid. on the ordinary and 5 per cent. preference. £25,000 considered as paid on 7 per cent. preference. Mortgages and charges: Nil.

Electric Supply Corporation, Ltd.—Capital, £750,000 in £431,262 ordinary stock units of £1, £250,000 preferred stock units of £1 and 68,738 units of ordinary shares of £1 each. Return dated May 8th. £431,262 ordinary stock and £250,000 preferred stock taken up. £529,000 paid. £152,262 considered as paid. Mortgages and charges: Nil.

T. M. C.-Harwell (Sales), Ltd.—Capital, £15,000 in £1 shares. Return dated January 12th. 10,000 shares taken up. £10,000 paid. Mortgages and charges: Nil.

Devereux, Moodie & Co., Ltd.—Capital, £5,000 in 2,500 preference and 2,500 ordinary shares of £1. Return dated January 14th. 1,900 preference and 1,001 ordinary shares taken up. £2,901 paid. Mortgages and charges: Nil.

C. C. Pudney & Co., Ltd.—Capital, £6,000 in £1 shares. Return dated February 12th. All shares taken up. £3,560 paid. £2,440 considered as paid. Mortgages and charges: Nil.

Hume, Atkins & Co., Ltd.—Capital, £6,500 in £1 shares. Return dated November 30th. All shares taken up. £6,500 paid. Mortgages and charges: £3,000.

Gothic Electrical Supplies, Ltd.—Capital, £50,000 in £1 shares. Return dated January 12th. 36,000 shares taken up. £5,400 paid. £30,600 considered as paid. Mortgages and charges: £14,500.

Kartret Switchgear Co., Ltd.—Capital, £2,500 in £1 shares. Return dated January 11th. All shares taken up. £2,500 considered as paid. Mortgages and charges: Nil.

Automobile Electrics, Ltd.—Capital, £500 in £1 shares. Return dated December 31st. 225 shares taken up. £225 paid. Mortgages and charges: £1,200.

Thermalux Electrical Products, Ltd.—Capital, £500 in £1 shares. Return dated May 21st. All shares taken up. £500 paid. Mortgages and charges: £750.

G. & L. Electrical Supply Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st (filed March 22nd). All shares taken up. £2 paid. £998 considered as paid. Mortgages and charges: £2,000.

Second Electric Supply Corporation, Ltd.—Capital, £5,000 in 5,000 shates of £1 each. Return dated June 28th. All shares taken up. £250 paid, being 1s. per share. Mortgages and charges: Nil.

Hassocks & Hurst Electricity Co., Ltd.—Capital, £5,000 in £1 shares. Return dated June 28th. All shares taken up. £250 paid (being 1s. per share). Mortgages and charges: Nil.

Cunningham Electrical & Radio, Ltd.—Capital, £1,000 in £1 shares. Return dated July 12th. 800 shares taken up. £800 paid. Mortgages and charges: Nil.

Boroughbridge Electrical Co., Ltd.—Capital, £500 in £1 shares. Return dated December 31st (filed February 19th). 100 shares taken up. £100 paid. Mortgages and charges; Nil.

Mortgages and Charges

Johnson & Phillips, Ltd.—Satisfaction in full on July 5th, 1945, of trust deed registered March 7th, 1933, securing £400,000 debenture stock.

Electrical & General Accessories (Leicester), Ltd.—Debenture dated July 11th, to secure £8,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Branch Nominees, Ltd.

Companies Struck off Register

The following companies were struck off the Register on August 10th:—Blockley Electrical Engineering Co., Ltd.; Cheltenham Wireless Supplies, Ltd.

Liquidations

Downton Electric Light Co., Ltd., and the **Amesbury Electric Light & General Supply Co., Ltd.**—Particulars of claims to the liquidator, Mr. A. M. Scott, 24-30, Gillingham Street, London, S.W.1, by September 10th.

Chipping Norton Electric Supply Co., Ltd.—Meeting on September 17th at 24-30, Gillingham Street, London, S.W.1, to receive an account of the winding-up by the liquidator, Mr. L. A. Pearl.

Princely Radio & Television Corporation (of Great Britain), Ltd., 24-25, Wells Street, Oxford Street, W.—Under the compulsory liquidation of this company meetings of the creditors and contributories were held on August 14th at the Board of Trade Offices, Columbia House, Aldwych, W.C. The company was registered in April, 1938, with a capital of £100 to carry on business as manufacturers of and dealers in goods of all kinds commonly known as radio and sound reproductive goods. The only liability was stated to be £300 and no assets were disclosed. A resolution was passed for Mr. J. M. McLeod, C.A. (Elles, Salaman & Co.), Bucklersbury, E.C., to wind up the company as liquidator.

Bankruptcies

R. A. Young, electrical and mechanical engineer, Gullet Passage, Shrewsbury.—Order made July 23rd for discharge subject to his consenting to judgment being entered against him for £150.

STOCKS AND SHARES

TUESDAY EVENING.

THE first reaction of Stock Exchange markets to the termination of the war was one that bordered on the anticlimax. There had been a fairly general rise in prices before the actual surrender of the Japanese was officially announced. The rise was attended by a considerable volume of buying by the public and a consequent raising of values in most departments round the Stock Exchange. The outlook, it seems superfluous to remark, continues somewhat clouded and uncertain. Peace has its problems as well as war, and it remains to be seen how industry will proceed under the new Government. Nationalisation of the Bank of England was mentioned in the King's Speech as a forthcoming result of the success of the Socialists at the poll. The various industries to which a similar scheme will apply remain in doubt as to what is going to happen. Awaiting this, Stock Exchange prices, while they remain firm, showed slight variations from the improvements that occurred on the eve of the Japanese surrender.

Home Railway Weakness

Heavy falls in Home Railway stocks are the direct result of apprehensions aroused in connection with nationalisation. Senior issues, previously regarded as gilt-edged and all but immune to any save monetary influences, are substantially down, as compared with the prices on the eve of the poll's declaration. That proprietors will be given a Government security in exchange for their present holdings is taken as assured, but nobody can tell the basis upon which the bargain will be carried out. Trustee stocks in the London Passenger Transport group have come down by three or four points. Southern Railway 5 per cent. preference is 10 lower on the month, at 110½. The junior stocks gave way, but in their case the subsequent recovery was more marked than in those of the gilt-edged issues.

Cheap Money and New Issues

Part of the fall which occurred immediately after the General Election result has now been recovered. Investment which before the Election was content to accept 3¾ to 4 per cent. from industrial shares, now looks for 4 to 4½ per cent. At the same time, the Government has announced its intention of keeping money rates as low as possible, and there is still talk even of a 1 per cent. Bank Rate. Side by side with the cheap money programme, a greater willingness is shown on the part of the Government to encourage new issues, particularly those designed to stimulate industry and the export trade.

Stock Exchange Co-operation

The Stock Exchange, as already mentioned, is co-operating with the Government and the Treasury in this purpose. Already several new issues have made their appearance. The shares in practically every case have been readily taken and the opening prices improved upon. This intention to quicken trade, through the medium of permission being given to new issues, will bring into competition with the older stocks and shares a good deal of fresh stock. So great, however, is the volume of money at present available for employment that any material decline in prices of the existing securities is, to say the least of it, improbable. The Stock Exchange co-operates with the Government, in the encouragement of industry, by relaxing the rigidity of its requirements hitherto laid down as precedent to the marketing of new issues. Every application for permission to deal is, however, subject to the customary strict scrutiny.

Nationalisation

Shares in the manufacturing and equipment companies experienced a partial recovery from the lowest prices touched during what may be called the General Election slump. The advance started when it became tolerably apparent that the war with Japan was on the point of termination. The movement received fresh encouragement from the announcement of the President of the Board of Trade that the Government had no intention of nationalising the cotton industry. Other branches of industry, it is thought, will probably be included in this policy of non-interference by the Government, although the utility services, gas, electricity, water, are, of course, definitely within the programme of nationalisation. Comparison of to-day's prices with those published a month ago shows a long catalogue of losses.

Yields on Electrical Equipment

Compared with the prices of a month ago, those now current are lower in nearly every case. In some instances, the fall has been fairly steep; in others, the rally resulting from Japan's defeat, wiped out the greater part of the decline. It must be admitted that the general run of prices remains high as tested by the yields obtainable from the popular shares. General Electrics cost about 94s. at which the return is a few pence under 3¾ per cent. Crompton Parkinson "A" at 32s. 6d. give £3 9s. and Associated Electrical Industries £3 12s. Lancashire Dynamo offer a better return; at 5⅛, the income is 4⅜ per cent. on the basis of the recently raised dividend of 22½ per cent. English Electric pay £3 14s., about the same as G.E.C.

Victoria Falls

Victoria Falls & Transvaal Power ordinary shares have risen to 93s. 9d., the annual report and accounts showing the regular 15 per cent. dividend, now paid for seven consecutive years, to be comfortably covered by earnings. The last dividend is less tax at 5s. 8d. in the £. The

(*Continued on page* 278)

ELECTRICAL INVESTMENTS

Past Month's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price Aug. 17	Month's Rise or Fall	Yield p.c.
Home Electricity Ordinary					
Bournemouth and Poole	12½	12½	58/6	−4/−	£ s. d. 4 5 6
British Power and Light	7	7	28/−	−4/−	4 18 4
City of London ..	5½	6	29/6	−1/6	4 1 4
Clyde Valley ..	8	8	38/−	−4/−	4 4 3
County of London	8	8	37/6	−5/−	4 5 4
Edmundsons ..	6	6	27/6	−3/6	4 7 3
Elec.Dis.Yorkshire	9	9	39/−	−7/−	4 12 4
Elec. Fin. and Securities ..	12½	13½	57/6	−4/−	4 13 9
Elec. Supply Corporation ..	10	10	47/6	−2/6	4 4 2
Lancs. Light and Power ..	7½	7½	34/3	−2/9	4 7 7
Llanelly Elec. ..	6	6	25/6	−3/−	4 14 1
Lond.Assoc.Electric	3	4	24/6	−2/3	3 5 2
London Electric	6	6	29/−	−2/6	4 2 9
Metropolitan E.S.	8	8	38/−	−4/6	4 4 3
Midland Counties	8	8	38/3	−5/−	4 4 0
Mid. Elec. Power	9	9	42/3	−2/9	4 5 4
Newcastle Elec...	7	7	28/9	−2/3	4 17 5
North Eastern Elec.	7	7	30/3	−5/3	4 12 7
Northampton ..	10	10	46/3	−4/3	4 8 6
Northmet Power	7	7	37/6	−2/6	3 14 8
Richmond Elec.	6	6	26/6	..	4 10 7
Scottish Power ..	8	8	36/6	−3/6	4 7 8
Southern Areas	5	5	21/−	−3/−	4 15 4
South London ..	7	7	29/6	−1/−	4 15 0
West Devon ..	5	5	25/−	..	4 0 0
West Glos. ..	4½	3½	25/−	−2/6	2 16 0
Yorkshire Elec...	8	8	38/6	−6/−	4 3 2
Public Boards					
Central Electricity :					
1955–75 ..	5	5	115	..	4 7 0
1951–73 ..	4½	4½	106	..	4 5 0
1963–93 ..	3½	3½	104½	..	3 7 0
1974–94 ..	3½	3½	101	..	3 3 9
LondonElec.Trans.	2½	2½	98	..	2 11 0
London & Home Counties 1955–75	4½	4½	111	..	4 1 4
Lond.Pass.Trans.Bd.					
A	4½	4½	115½	−3	3 16 0
B	5	5	116½	−4	4 5 10
C	3¼	3	61	−6½	4 18 4
West Midlands J.E.A. 1948–68	5	5	106½	..	4 14 0
Overseas Electricity Companies					
Atlas Elec. ..	Nil	Nil	7/3	−9d.	—
Calcutta Elec. ..	6*	6*	66/−	+5/−	1 15 10
Cawnpore Elec...	7	13	60/−	..	4 6 8
East African Power	7	7	37/−	+1/6	3 17 9
Jerusalem Elec.	7	5	27/−	−6d.	3 14 1
Kalgoorlie (10/−)	5	5	10/6	+6d.	5 0 0
Madras Elec. ..	Nil	4	40/6	−1/−	1 19 6
Montreal Power	1½	1½	24/2	−1/2	—
Nigerian Elec. ..	8	10	40/−	+1/6	5 4 0
PalestineElec."A"	5*	5*	37/−	−2/6	2 14 0
Perak Hydro-elec.	6	7	17/−	+6d.	—
Tokyo Elec. 6%	6	6	37½	+14	—
VictoriaFallsPower	15	15	93/9	+5/−	3 4 0
WhitehallInv.Pref.	—	6	26/−	..	4 12 4

Company	Dividend Previous	Dividend Last	Middle Price Aug. 17	Month's Rise or Fall	Yield p.c.
Equipment and Manufacturing					
Aron Elec. Ord.	10	15	62/6	−1/6	£ s. d. 4 16 0
Assoc. Brit. Eng.	6	7	53/9	..	2 12 0
Assoc. Elec. :					
Ord.	10	10	54/−	−4/6	3 14 0
Pref. ..	8	8	40/6	−6d.	3 19 1
AutomaticTel.&El.	12½	12½	68/−	−1/6	3 13 6
Babcock & Wilcox	11	12	55/−	−4/3	4 7 3
British Aluminium	10	10	43/6	+6d.	4 12 0
British Insulated & Callender's..	..	..	45/−	−2/−	—
British Thermostat (5/−)	18½	18½	20/−	+3d.	4 12 6
British Vac. Cleaner (5/−)	30	30	33/3	−⅓	4 10 3
Brush Ord. (5/−)	8	9	9/9	−3d.	4 12 4
Burco (5/−) ..	15	15	14/6	−9d.	5 3 5
ChlorideElec.Storage	15	15	85/−	−½	3 10 7
Christy Bros. ..	12½	17½	77/6	..	4 10 2
Cole, E. K. (5/−)	15	20	8/3	−1/9	2 12 4
ConsolidatedSignal	24	27½	6¼	−1/4	4 4 8
Cossor, A. C. (5/−)	10*	12½*	40/6	−1/−	1 11 6
Crabtree (10/−) ..	17½	17½	41/3	−2/3	4 5 0
Crompton Parkinson Ord. (5/−) ..	20	22½	31/6	−2/6	3 11 5
De La Rue ..	40	40	10¾	−1/4	3 14 6
E.M.I. (10/−) ..	6	8	33/−	−2/−	2 8 6
Elec.Construction	10	12½	60/−	..	4 3 4
Enfield Cable Ord.	12½	12½	63/−	−2/−	3 19 4
English Electric	10	10	53/−	−3/6	3 15 6
Ericsson Tel. (5/−)	22*	20*	50/−	−4/−	2 0 0
Ever Ready (5/−)	40	40	41/−	−1/6	4 15 3
Falk Stadelmann	7½	10	35/6	−1/−	5 12 8
Ferranti Pref. ..	7	7	33/6	..	4 3 7
G.E.C. :					
Pref.	6½	6½	34/6	..	3 15 4
Ord.	17½	17½	93/−	−3/6	3 15 5
GeneralCable (5/−)	15	15	19/−	..	3 19 0
Greenwood&Batley	15	15	47/6	−5/−	7 1 2
H.T.A. (10/−) ..	12½	12½	29/−	−1/−	4 6 2
Henley's (5/−) ..	20	20	28/−	..	3 11 5
4½% Pref. ..	4½	4½	24/6	..	3 13 6
Hopkinsons ..	17½	20	82/6	−4/−	4 17 1
India Rubber Pref.	5½	5½	24/−	..	4 11 9
Intl. Combustion	30	32½	8	−½	4 1 3
Johnson & Phillips	15	15	74/−	−5/6	4 1 1
LancashireDynamo	22½	22½	5½	−½	4 8 0
Laurence,Scott(5/−)	12½	12½	13/6	+3d.	4 12 5
London Elec. Wire	7½	7½	40/−	..	3 15 0
Mather & Platt	10	10	51/9	−2/−	3 17 6
Metal Industries(B)	8½	9	46/3	−4/9	3 18 0
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Mid. Elec. Mfg.	25	25	7½	−⅛	3 6 8
Murex	20	20	96/6	−1/−	4 3 0
Newman Ind.(2/−)	20	20	7/6	−3d.	5 6 5
Philco (2/−) ..	—	—	14/−	..	—
Power Securities	6	6	27/−	−1/6	4 9 0
Pye Deferred(5/−)	25	25	31/3	−2/−	3 14 7
Ransome & Marles	20	20	85/−	−1/8	4 14 1
Revo (10/−) ..	17½	17½	45/−	..	3 17 9
Reyrolle ..	12½	12½	72/−	−3/−	3 9 5

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Aug. 17	Month's Rise or Fall	Yield p.c.
Equipment and Manufacturing (*Continued*)					£ s. d.
Siemens Ord. ..	7½	7½	36/–	−2/–	4 3 4
Strand Elec. (5/–)	10	12½	10/–	−6d.	6 5 0
Switchgear & Cowans (5/–) ..	20	20	20/–	−1/6	5 0 0
T.C.C. (10/–) ..	7½	10	25/–	−6d.	4 0 0
T.C. & M. ..	10	10	53/–	−9/6	3 15 6
TelephoneMfg.(5/–)	9	9	12/–	..	3 15 0
Thorn Elec. (5/–)	20	20	28/9	−1/3	3 9 6
Tube Investments	20	22½	5⅝	−⅜	4 6 7
Vactric (5/–) ..	Nil	22½	22/–	−1/–	5 2 4
Veritys (5/–) ..	7½	7½	7/9	−1/3	4 16 9
WalsallConduits(4/–)	55	55	56/3	+1/9	3 18 3
Ward & Goldstone (5/–)	20	25	30/6	..	4 2 0
WestinghouseBrake	14	14	73/6	−5/6	3 16 1
West, Allen (5/–)	7½	7½	8/–	−6d.	4 13 9
Traction and Transport					
Anglo-Arg. Trans.:					
First Pref. (£5)	Nil	Nil	2/6	..	—
4% Inc. ..	Nil	Nil	6	−½	—
Brit. Elec. Traction:					
Def. Ord. ..	45	45	1035	−175	4 7 0
Pref. Ord. ..	8	8	170	−20	4 14 2
Bristol Trams ..	10	10	52/–	−5/6	3 17 0
Brazil Traction	1¾	2	28¼	..	7 1 7
Calcutta Trams..	6½	7½	79/–	+6d.	1 18 0

Company	Dividend Previous	Dividend Last	Middle Price Aug. 17	Month's Rise or Fall	Yield p.c.
					£ s. d.
Cape Elec. Trams	5	6	25/–	..	4 16 0
Lancs. Transport	10	10	43/3	−5/9	4 13 0
Southern Rly.:					
5% Prefd. ..	5	5	71½	−5	6 15 10
5% Pref. ..	5	5	110½	−10	4 3 0
T. Tilling ..	10	10	50/6	−7/6	3 19 4
West Riding ..	10	10	42/6	−5/–	4 14 1
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	125	+1½	4 16 0
Def.	1½	1½	30½	..	4 18 4
Anglo-Portuguese	8	8	28/6	−1/6	5 12 3
Cable & Wireless:					
5½% Pref. ..	5½	5½	111½	−3½	4 18 8
Ord.	4	4	89½	−3½	4 9 5
Canadian Marconi	$1 Nil	4 cts.	16/6	..	—
Globe Tel. & Tel.:					
Ord.	8½*	5*	40/6	−3/6	2 9 6
Pref.	6	6	29/–	−2/6	4 2 9
Great Northern Tel. (£10)	Nil	Nil	33½	+1	—
Inter. Tel. & Tel.	Nil	Nil	28	−3½	—
Marconi-Marine..	7½	7½	36/–	−6d.	4 3 4
Oriental Tel. Ord.	4	4	61/3	+3/3	—
Telephone Props.	Nil	6	22/–	+1/–	5 9 1
Tele. Rentals (5/–)	10	10	12/–	−9d.	4 3 4

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 276)

report says that sales during the first six months of the present year are rather better than those in the corresponding period of 1944, but that costs are still showing a tendency to rise. This is also the main feature in the company's accounts for the year ended December last. The company occupies a strong financial position, and the ordinary shares, in spite of the meagre yield they offer, are a front-rank industrial investment.

Telephone Manufacturing

The Telephone Manufacturing Company, at the meeting last month, announced approximate totals of some of the principal items manufactured during the war, of which 1,300,000 microphones, 1,200,000 receivers, 70,000 switchboards of all sizes up to 200 lines, are a few. The amount of wire used was approximately 12½ million miles. The company, it may be added, is interested in Telephone Rentals, Ltd., and controls various subsidiaries. The issued capital is now £385,000. For the past ten years, the company has paid an annual dividend of 9 per cent. The shares are of 5s. each and at the present price of 12s. the yield comes to 3¾ per cent., which in itself indicates the expectation of an increase under peace conditions.

Cawnpore Electric Dividend

Calcutta Electric Supply ordinary have had a 5s. rise during the past month, but Calcutta Trams show little change. The Cawnpore Electric Supply Corporation, which used to pay a steady 10 per cent. every year, lowered this dividend to 7 per cent. for 1943, but, by making up the 1944 dividend to 13 per cent., the average is restored to the regular rate. As already announced, the Cawnpore Electric is to be bought in 1947 by the Government of the United Provinces of India. The price of the shares is about £3. At this, the yield on the 13 per cent. dividend comes to £4 6s. 8d. per cent. As, however, 3 per cent. of the dividend is to make up the average dividend to 10 per cent., and may not be repeated, should the yield be worked out on the latter basis, and entered at £3 6s. 8d. per cent? The conscientious calculator would be glad of an answer to this quiz.

Handicaps on Progress

Three principal factors militate against profit-earning capacity in these days, according, that is to say, to the majority of company statements and chairmen's speeches which are appearing. Rising cost of materials, shortage of stock, and labour charges are the chief handicaps upon expansion of profit. To these must be added, of course, the unceasing burden of taxation. According to the cautious promise made by the then Chancellor of the Exchequer in his Budget speech last April, there should be a supplementary Budget this autumn. Whether discreetly or not, hopes have been entertained that this will foreshadow some alleviation of the weight of taxation that at present presses heavily upon industry, and retards the wheels of enterprise.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

ALLMANNA Svenska Elektriska Aktiebolaget.—" Means for connecting loads to polyphase networks alternatively in different phase sequence." 13512/43. August 29th, 1942. (571031.)

Allmanna Svenska Elektriska Aktiebolaget., and E. Adamson.—" Arrangement for coupling a mechanically tuned system with a member actuated by it." 5237. March 21st, 1944. (571041.)

K. R. Boydell.—" Electrical strain gauge apparatus." 16158. October 1st, 1943. (571003.)

British Insulated Cables, Ltd., London Passenger Transport Board, T. C. Broom and T. Wilkinson.—" Cross-overs for overhead conductor systems for electric traction." 2108. February 4th, 1944. (571073.)

British Thomson-Houston Co., Ltd.—" Resinous condensation products." 2540/43. February 21st, 1942. (570956.) " Removal of anions from aqueous media." 12702/43. August 11th, 1942. (571029.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—" Variable inductance devices." 16594. October 11th, 1943. (571005.)

Callender's Cable & Construction Co., Ltd., P. V. Hunter and C. O. Boyse.—" Electric conductor for overhead suspension." (Cognate applications 16978/43 and 11906/44.) October 15th, 1943. (571008.)

P. F. Clarke and G. D. Worthington.—" Underground conduits or the like." 15548. September 22nd, 1943. (570970.)

English Electric Co., Ltd., and H. S. Carnegie.—" Electric motor control system." 14189. August 31st, 1943. (571057.)

C. E. Every (Chicago Metal Hose Corporation).—" Apparatus for electric resistance welding." 11744. July 19th, 1943. (570991.)

Ferranti, Ltd., and H. Easton.—" Electrical measuring and indicating instruments." 2868. February 16th, 1944. (571038.)

J. E. Fry.—" Means for heating electrically handlebars of motor-cycles and like control handles of power-driven machines." 17176. October 19th, 1943. (571069.)

General Cable Corporation.—" Method of and apparatus for coating wire." 15842/43. September 30th, 1942. (571062.)

H. W. Denton-Ingham (Lumalampen Aktiebolag).—" High-pressure discharge tubes." 17710. October 27th, 1943. (571072.)

T. H. Kent.—" Bonding devices for use with screened electric cables." 19565. November 23rd, 1943. (570975.)

J. Lucas, Ltd., and H. H. Foxall.—" Connections for electrical conductors." 14203. September 1st, 1943. (517033.)

Revo Electric Co., Ltd., F. H. Reeves and A. N. Harding.—" Terminal connection for electric hot plates and other heating elements." 17054. October 18th, 1943. (571067.)

D. T. Smout and D. D. Smout.—" Electrode holders for electric welding." 1138. January 20th, 1944. (571035.)

F. C. Stephan.—" Connecting means for ceramic condensers and other electrical components of tubular or cup shape." 15986. September 29th, 1943. (571000.)

J. Thorley.—" Means for locating a wireless transmitter, and indicating the position on map by a point of light." 3381. March 2nd, 1943. (Addition to 551376.) (570986.)

E. L. C. White, L. R. J. Johnson and E. A. Nind.—" Electric potential dividing arrangements." 13240. August 16th, 1943. (570966.)

Blackburn Exhibition

EQUIPMENT of the future labour-saving house and all-electric factory is shown at an exhibition in the Blackburn Public Halls. Organised by British Electrical Development Association with the support of the Blackburn, Bacup, Accrington and Rawtenstall undertakings and the Lancashire Electric Power Co., the display covers a wide range of domestic and canteen apparatus. The " North-West " built-in kitchen is of particular interest, being based on ideas submitted by housewives. It incorporates a thief-proof service hatch, stainless steel sink, built-in cupboards and a refrigerator. Larger domestic units of different patterns include fluorescent illumination, dining-room recess and washing facilities. A prefabricated bathroom-kitchen requiring only a few hours to install is also attracting a good deal of attention. All-electric industrial plant includes a Northrop automatic loom, electrode boilers, humidifiers and infra-red drying plant, etc.

Opening the exhibition on August 14th, Councillor G. B. Eddie, chairman of the Blackburn Corporation Housing Committee, said that electricity must have an opportunity of proving its enormous benefit to the community. He wanted big developments in its application to housing because it would reduce domestic drudgery and help to provide cleanliness, comfort and convenience. But all the gadgets in the world would not make satisfactory a home badly planned to begin with. He wanted an end of the pre-war policy of using electricity grudgingly, with the minimum number of switches. A complete electrical installation was not an expensive luxury but an ordinary necessity.

Sir Thomas Higham (Accrington), agreeing on the possibilities of electricity, said that one of the greatest drawbacks was its cost. If nationalisation of electricity came it was certain that, properly administered, the industry would be of enormous benefit to the country.

Mr. C. D. Taite, managing director, Lancashire Electric Power Co., said one reason why electricity was expensive was the small-scale generation which had applied hitherto. With proper planning this drawback would be overcome.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—November 2nd. Melbourne and Metropolitan Tramways Board. Pumpless rectifier equipment. Tender No. 1251. Controller of Stores.

December 19th. Victorian Electricity Commission. Three water-driven turbo-generators and accessory plant for Kiewa. Spec. 45-46/3.

Birmingham.—August 29th. Electric Supply Department. Distribution transformers. (August 10th.)

September 12th. Electric Supply Committee. Domestic apparatus. (August 17th.)

Bradford. — August 29th. Corporation. Static transformers. (August 3rd.)

Brierfield.—September 20th. Electricity Department. Switchgear equipment and transformers. (August 17th.)

Brighouse.—August 31st. Town Council. Transformers and switchgear. (August 3rd.)

Glasgow.—August 31st. Corporation Lighting Department. 500 lanterns for electric lamps. Specs., etc., from the Lighting Department, 20, Trongate.

Scotland.—October 15th. North of Scotland Hydro-Electric Board. 132-kV transmission lines. (August 10th.)

Sheffield.—August 27th. Electricity Department. Three 1,000-kVA 11,200/3,300-V transformers. (August 3rd.)

West Hartlepool.—August 27th. Town Council. Paper-insulated cables. (August 10th.)

West Riding.—September 1st. Standing Joint Committee. Electrical work in connection with adaptations at the West Riding Constabulary Headquarters, Wakefield. Specifications and forms of tender from the county architect, County Hall, Wakefield.

Orders Placed

Darlington.—Corporation. Accepted. Overhead line in connection with supply of electricity to Neasham Brickworks (£820).—Riley & Neate.

Stockton-on-Tees.—Town Council. Accepted. Cable (£9,131).—Edison Swan Cables.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Armadale (West Lothian).—Permanent (110) and temporary (45) houses; W. McGregor, burgh surveyor.

Bedworth.—Houses (40), Poplar Farm estate, for U.D.C., S. J. Oldham, architect, 4, Queen Victoria Road, Coventry.

Belfast.—Houses on Sunningdale estate, Parkfield, for the Northern Ireland Housing Trust; T. T. Houston, architect, Kingscourt, 17, Wellington Place.

Berwick-on-Tweed.—Houses on a 20-acre site at Tweedmouth; borough engineer.

Bradford.—Central library and bus station (£500,000); city architect, Town Hall.

Bromsgrove.—Houses (208), Woodrow Lane estate; U.D.C. surveyor, Council House.

Cheetham.—Rebuilding chocolate factory, Smedley Lane, for Fugistalls, Ltd.; W. Johnson & Sons, 27, Oldham Road, Manchester, 10.

Clayton.—Works additions for J. Mountford & Co., Ltd., forgemasters; A. Travis, architect, New Market Chambers, Yorkshire Street, Rochdale.

Crayford (Kent).—Houses (25); U.D.C. surveyor, Municipal Buildings.

Enfield (Middlesex).—Houses (38), Addison Road; U.D.C. surveyor, 7, Little Park Gardens.

Glasgow.—Houses and shops at Pollok (£11,997) and Knightswood (£110,000) housing schemes; city architect.

Hulme.—Works extensions for Davis & Brocklesby, Ltd., brassfounders; A. McDonald, architect, 637, Mauldeth Road West, Chorlton-cum-Hardy.

Inverness.—Additions to mill for Hugh Mackenzie & Co., Kingsmills Road (£12,000); manager.

Isle of Wight.—Central kitchen (£2,698), Lowerville, Ventnor; D. Day & Sons, builders, Bonchurch.

Kinross.—Houses (10) with electrical work; town clerk.

Newcastle-on-Tyne.—Factory, Mitchell Street; R. B. Charlton & Co., brassfounders, Railway Bank.

Oldham.—Additions, Boundary Park General Hospital; Whitworth Whittaker, Ltd., builders, Robin Hill Works.

Openshaw.—Extensions to steel works; Cooke & Ferguson, Ltd., constructional engineers, Victoria Steel Works, Manchester, 11.

Redcar.—Houses (300); J. Locking, borough engineer.

Smethwick.—Works reconstruction, Parkes Street; E. A. Sprigg (Engg. Construction), Ltd.

Southport.—Houses (30), Russell estate; borough engineer.

South Shields.—New factory for A. J. Wares & Co.; Henderson Bros., Smith Street.

Tettenhall.—Houses (30), School Road, Tettenhall Wood, for U.D.C.; J. W. Mason, Council Offices, Upper Green, Tettenhall, Staffs.

Wenlock.—Houses (22), Dark Lane, Broseley; J. Brian Cooper, architect, 177, Corporation Street, Birmingham, 4.

Workington.—Houses (100), Laverock Hall estate; James Leslie & Sons, Ltd.